# INDUSTRIAL MEDICINE *and* SURGERY

*Established 1932*

feature issue . . . .

Second National Congress on Environmental Health

SEPTEMBER 1961

Volume 30 Number 9

*The International Journal of Medicine in Industry*

## In skeletal muscle spasm

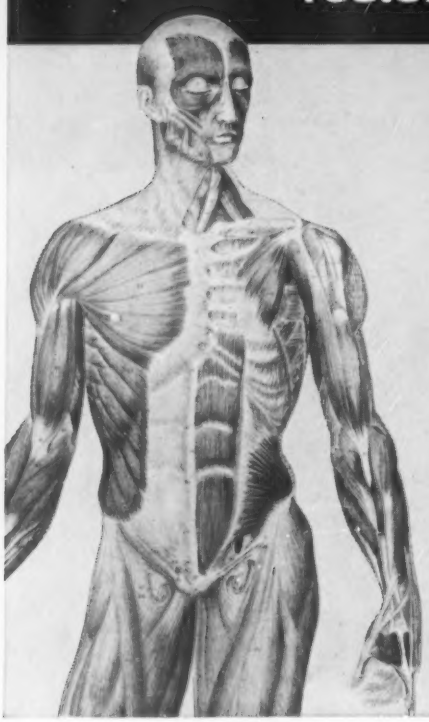
# NORFLEX®*

orphenadrine citrate 100 mg. tablets

## quickly resolves the spasm . . .

## relieves the pain . . .

## restores normal function



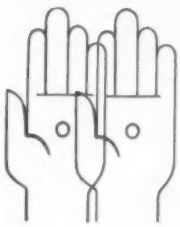
**Prolonged relief**

may last up to 12 hours after administration . . . permits uninterrupted sleep at night . . . does not interfere with daytime alertness . . . only the muscles in spasm respond . . . no lessening of general muscle tonus.

**Contraindications:**

Routine precautions against use of anticholinergic drugs should be observed. Norflex should be used with caution in glaucoma, tachycardia, or urinary retention.

**Simple dosage**



for all adults regardless of age or sex: 2 tablets daily—one in the morning, one in the evening—easily remembered . . . offers better patient cooperation.

NORFLEX is a product of

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*U.S. Patent No. 2,567,351; other patents pending

# INDICATION: *Surgical procedure*

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## cuts healing time in surgical procedures

The inflammation, swelling and pain that follow surgical trauma resolve more quickly when Chymoral therapy is employed pre- and post-operatively than when healing is allowed to take its natural course. Chymoral modifies inflammatory reaction, dissipates edema and blood extravasates in the tissues, improves regional circulation, and thereby assists the reparative functions of the body. Chymoral also hastens resolution of inflammation, hematoma and edema in accidental trauma—fractures, sprains, contusions and lacerations.[1-4]

*Controls inflammation,*
*curtails swelling, curbs pain*

1. Teitel, L. H., *et al.:* Indust. Med. 29:150, 1960. 2. Billow, B. W., *et al.:* Southwestern Med. 41:286, 1960. 3. Beck, C., *et al.:* Clin. Med. 7:519, 1960. 4. Clinical Reports to the Medical Department, Armour Pharmaceutical Company, 1960.

**CHYMORAL**

Chymoral is an ORAL anti-inflammatory enzyme tablet specifically formulated for intestinal absorption. Each tablet provides enzymatic activity, equivalent to 50,000 Armour Units, supplied by a purified concentrate which has specific trypsin and chymotrypsin activity in a ratio of approximately six to one. ACTION: Reduces inflammation of all types; reduces and prevents edema except that of cardiac or renal origin; hastens absorption of blood and lymph extravasates; helps to liquefy thick tenacious mucous secretions; improves regional circulation; promotes healing; reduces pain. INDICATIONS: Chymoral is indicated in respiratory conditions such as asthma, bronchitis, rhinitis, sinusitis; in accidental trauma to speed absorption of hematoma, bruises, and contusions; in inflammatory dermatoses to ameliorate acute inflammation in conjunction with standard therapies; in gynecologic conditions such as pelvic inflammatory disease and mastitis; in obstetrics as episiotomies and breast engorgement; in surgical procedures as biopsies, hernia repairs, hemorrhoidectomies, mammectomies, phlebitis and thrombophlebitis; in genitourinary disorders as epididymitis, orchitis and prostatitis; in dental and oral surgery as fractures of the mandible or maxilla, difficult or multiple extractions, and alveolectomies. CONTRAINDICATIONS: None known. INCOMPATIBILITIES: None known. Antibiotics as well as generally accepted measures may be coadministered. SIDE EFFECTS: Mild gastric upsets, rarely encountered. DOSAGE: Recommended initial dose is two tablets q.i.d.; one tablet q.i.d. for maintenance. SUPPLIED: Bottles of 48 and 250 tablets.

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**CHYMORAL** *ORAL systemic anti-inflammatory enzyme tablet*

# What do these have in common?

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For full information, see your Squibb Product Reference or Product Brief.

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*the Priceless Ingredient*

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# INDUSTRIAL MEDICINE and SURGERY

ESTABLISHED 1932

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# CONTENTS


Introduction to this Feature Issue ..... 349
Henry F. Vaughan, Dr. P.H.

The Keynote Address: Purpose of the Congress ..... 350
Henry F. Vaughan, Dr. P.H.

Man and His Environment — A Conference Resumé ..... 354
Carey P. McCord, M.D.

Man Versus Environment ..... 369
Rene Dubos, Ph.D.

Biological Aspects of Environment ..... 374
Thomas Francis, Jr., M.D.

Chemical Aspects of Environmental Health ..... 380
Robert A. Kehoe, M.D.

Physical Aspects of Environment ..... 390
Abel Wolman, Dr. Engr.

Social and Economic Factors Influencing Environment ..... 393
Joseph J. Spengler, Ph.D.

A Public View: Man Versus Environment ..... 400
The Honorable John E. Fogarty

Environmental Needs for Industry ..... 403
Alexander M. Turner, A.B., and H. A. Barnby, M.S.

Needs in the Food Industries ..... 406
Charles Glen King, Ph.D.

The Environment and Public Health ..... 410
Herman E. Hilleboe, M.D.

The Federal Government and Environmental Health ..... 417
John D. Porterfield, M.D.

Food and Drugs ..... 422
The Honorable George P. Larrick, D.Sc.

Methodology for Industry ..... 425
F. K. Doscher

Methodology for Government ..... 430
Leona Baumgartner, M.D.

Personal News and Notes ..... 4, 6

Comment and Opinion ..... 29

Index of Advertisers ..... 38



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# PERSONAL NEWS AND NOTES

A. JOHN NELSON, M.D., President, and FORREST E. RIEKE, M.D., Program Chairman, invite all groups and persons with an interest in health and welfare of the working population to attend the annual meeting of the Northwest Association of Occupational Medicine that will be held Sunday, September 10, at the Hotel Multnomah in Portland, Oregon. A varied program has been planned, dealing with such problems as glaucoma, air pollution, resistance of venereal pathogens to antibiotics, the community impact of the plant medical program, work and the ailing heart, and rehabilitation.

The program is planned to complement the Eighth Annual Pacific Northwest Industrial Health Conference which will be held at the same location September 11 and 12. This Conference has been organized primarily around panel discussions, with the following themes: Mental Health and Industry; Environment and Health; Occupational Health Programs; and Role of Industry and Business in Health Programs. The participants will include not only medical directors and industrial hygienists, but also industrial nurses, psychiatrists, representatives from universities, insurance companies, public health organizations, and personnel and industrial relations departments of various West Coast industries. MR. IRVING WINSLOW, of Norris, Beggs and Simpson in Portland, is Conference General Chairman.

L. E. HAMLIN, M.D., retired as Medical Director of the American Brake Shoe Company, Chicago, on August 1, 1961. A member of the Industrial Medical Association, the American College of Surgeons and the American Trudeau Society, DR. HAMLIN graduated from the University of Toronto Faculty of Medicine in 1922.

CARL A. NAU, M.D., has been appointed Professor, and Director of the newly created Institute of Environmental Health at the University of Oklahoma Medical Center, Department of Preventive Medicine and Public Health, in Oklahoma City.

DR. NAU was formerly associated with the University of Texas, Medical Branch, in Galveston. He graduated from the Rush Medical College in Chicago in 1935.

V. C. BAIRD, M.D., Medical Director of the Humble Oil and Refining Company, Houston, Texas, has announced the organization of the Headquarters Medical Department which will serve in an "advisory and services management" capacity. It will administer the medical policy of the company, coordinate all medical activities and provide medical services to all headquarters organizations and to the Southwest Region, the Manufacturing Division, the Marine Division and the Humble Pipe Line Company. Mr. William Naden will be Contact Director for the Department.

The following appointments have been made:

ROBERT A. WISE, M.D., who has been serving as Assistant Chief Physician in the Medical Department of the Southwest Region, is appointed Associate Medical Director and will coordinate medical services for the Southwest.

H. B. SNYDER, M.D., who has been serving as Senior Physician in the Medical Department of Standard Oil Company (New Jersey) in New York, New York, is appointed Associate Medical Director and will coordinate medical services for the Manufacturing Division and the Humble Pipe Line Company.

H. T. ENGELHARDT, M.D., who has been serving as Internist in the Medical Department of the Southwest Region, is appointed Chief Internist and will be administratively responsible for the Clinic.

## ★ AMERICAN ASSOCIATION OF RAILWAY SURGEONS ★

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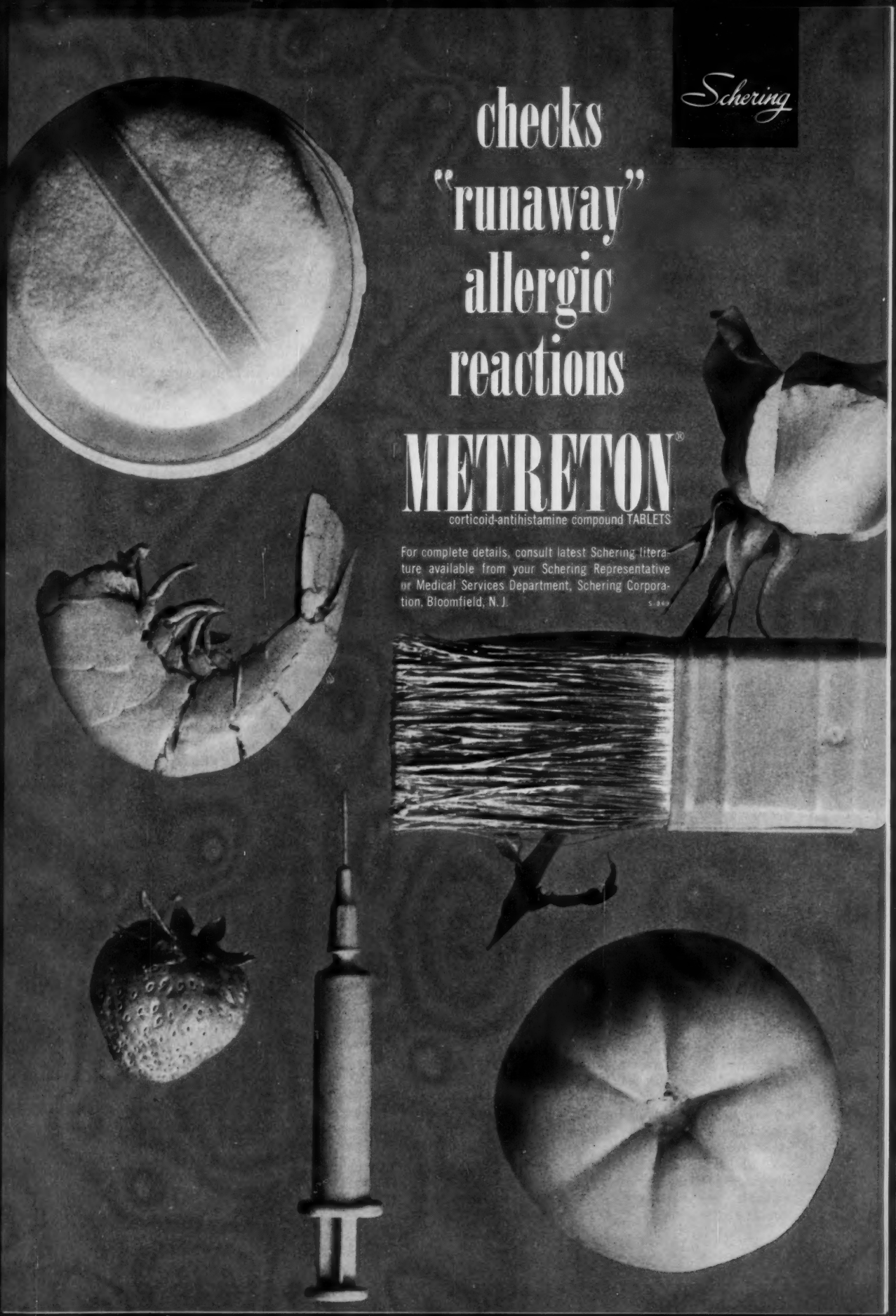
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C. H. MONTGOMERY, M.D., who has been serving as Internist in the Medical Department of the Southwest Region, is appointed Internist, and will coordinate Medical Services for the Marine Division.

A full-time five-day course in industrial health for nurses will be given beginning November 6, 1961, by the Department of Industrial Medicine of New York University Post-Graduate Medical School, of the New York University Medical Center.

The course, limited to 50 nurses engaged in industrial nursing, will be given under the direction of DAVID H. GOLDSTEIN, M.D., Professor of Industrial Medicine, and the nurse faculty of the department.

Applications should be sent to the Dean, NYU Post-Graduate Medical School, 550 First Avenue, New York 16, N. Y. Tuition: $60. Course 484.

ROLLAND J. MAIN, Ph.D., of South Otselic, N. Y., has been appointed Assistant Secretary to the Council on Drugs of the American Medical Association.

A former Professor of Physiology and head of the Department at the Medical College of Virginia, DR. MAIN has for the past 16 years been with Eaton Laboratories, Norwich, N. Y., as Medical Editor, Director of Advertising and Scientific Information and, recently, Director of Public and Professional Relations.

DR. MAIN is a graduate of Rutgers University and holds a doctorate in physiology from the University of Oregon. He was for some years Director of Eaton's publication to physicians, *The Medical Director's Notebook.*

The A.M.A.'s Council on Drugs, established in 1905, is developing a greatly expanded and intensified program to provide physicians with early unbiased information on all types of new drugs and drug therapy. The Council's Chairman is DR. ISAAC STARR of Philadelphia, Research Professor of Therapeutics at the University of Pennsylvania. Its Secretary is DR. WILLIAM C. SPRING, JR.

More than 100 industrial safety experts from the United States and Canada are expected to attend the Chemical Industry Safety Workshop in Niagara Falls, Canada, September 27.

The Workshop, sponsored by the General Safety Committee of the Manufacturing Chemists' Association, Inc., will provide committee members with an opportunity to discuss and share solutions of common safety problems with production, technical, and safety personnel in the chemical industry in Canada and northern Pennsylvania and western New York. MR. J. S. QUEENER, Manager, Employee Relations Department of E. I. du Pont de Nemours & Company, Inc., and chairman of the MCA committee, will be the workshop moderator. Collaborating with MCA on the workshop will be the Niagara Division of the Industrial Accident Prevention Association, for Canada, and the American Society of Safety Engineers.

Except for a short explanation of the purpose of the meeting by the moderator there will be no set speeches. The time will be spent in discussing questions raised from the floor. It is hoped that discussion will concentrate more on the technical aspects of safety in chemical manufacture, storage, handling and use rather than on fundamental safety matters.

COLONEL JOHN PAUL STAPP, Assistant for Aerospace Medicine, Advanced Studies Group, Brooks Air Force Base, Texas; PROFESSOR JAMES J. RYAN, Department of Mechanical Engineering, University of Minnesota; and MR. MERRILL K. CRAGUN, Associate Director of the Center for Continuation Study, University of Minnesota, are in charge of the Fifth Stapp Automotive Crash and Field Demonstration Conference to be held at the University of Minnesota, Minneapolis, September 14 to 16, 1961.

A number of medical and surgical specialists will participate in the conference, the purpose of which is to determine how various structural parts of an automobile may contribute to death and injuries sustained in automobile accidents. The American Association for Automotive Medicine is cooperating with the sponsors of the conference.

New York University Medical Center, Institute of Physical Medicine and Rehabilitation, will again offer three sessions of the four week course, "Advanced Physical Rehabilitation Methods for Physical & Occupational Therapists," November 13 to December 8, 1961; February 5 to March 2, and April 23 to May 18, 1962.

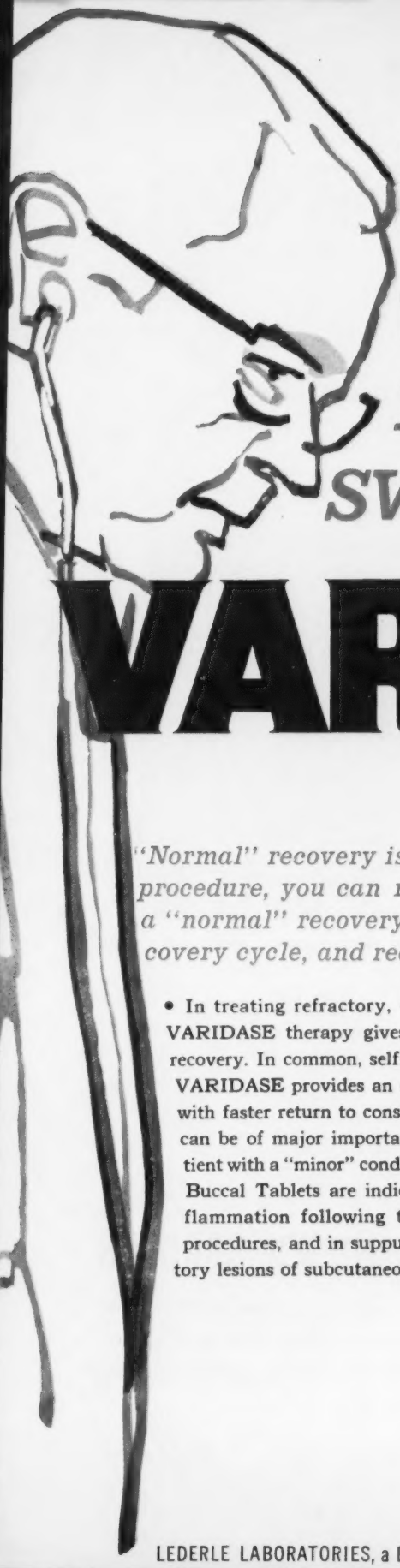
Also, the Institute will offer three sessions of the three week course, "Seminar in Physical Rehabilitation Methods for Nurses," October 16 to November 3, 1961; January 8 to January 26, 1962, and March 26 to April 13, 1962.

Instructors for both courses will include HOWARD A. RUSK, M.D., Professor and Chairman of the Department of Physical Medicine and Rehabilitation; GEORGE G. DEAVER, M.D., DONALD A. COVALT, M.D.; MRS. EDITH B. LAWTON, M.A., R.P.T., other members of the Institute staff, and guest lecturers.

For further information and application forms, write MRS. EDITH B. LAWTON, Director, Postgraduate Education for Paramedical Personnel, New York University Medical Center, Institute of Physical Medicine and Rehabilitation, 400 East 34 St., New York 16, N. Y.

## Died

FRANK R. GRIFFIN, M.D., 63, of Toronto, Canada, on July 4, 1961. DR. GRIFFIN drowned in a boating accident on Wawashkesh Lake in Canada, while fishing alone. He apparently had trouble with the outboard motor. When it started suddenly he was thrown into the water, and the overcoat he was wearing dragged him under. DR. GRIFFIN was Medical Director of Lever Brothers, Ltd. in Toronto. A graduate of the University of Toronto Faculty of Medicine in 1923, DR. GRIFFIN was a member of the Industrial Medical Association and the American Medical Association.



*do all you can whenever there is local inflammation/swelling/pain...*

# VARIDASE®

STREPTOKINASE-STREPTODORNASE LEDERLE

## *buccal tablets*

*"Normal" recovery is not enough. Now, by adding VARIDASE to your procedure, you can release your patient from the stress and pain of a "normal" recovery—put comfort in convalescence, shorten the recovery cycle, and reap the reward of greater patient appreciation.*

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• Precautions: VARIDASE has no adverse effect on normal blood clotting. Care should be taken in patients on anticoagulants or with a deficient coagulation mechanism. When infection is present, VARIDASE Buccal Tablets should be given in conjunction with antibiotics.

• Dosage: *One buccal tablet four times daily usually for five days. To facilitate absorption, patient should delay swallowing saliva.*

• Supplied: *Each tablet contains 10,000 Units Streptokinase, 2,500 Units Streptodornase. Boxes of 24 and 100 Tablets.*

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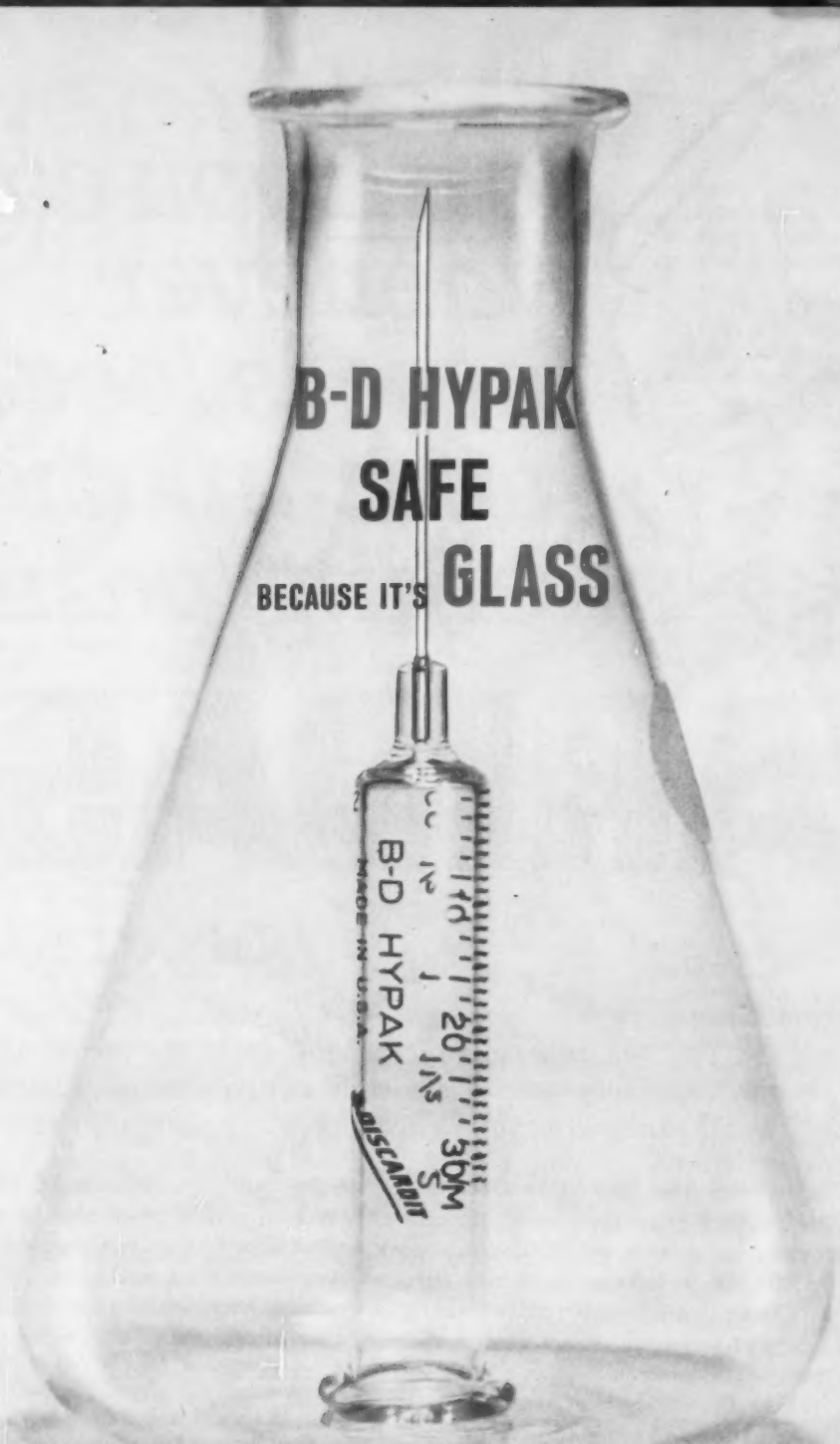


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SUPPLIED: *Tablets*, 1 mg. (pale orange, scored). *Lontabs*, 2.5 mg. (orange). *Syrup* (pink), containing 1 mg. Forhistal maleate per 5-ml. teaspoon. *Pediatric Drops* (pink), containing 0.5 mg. Forhistal maleate per 0.6 ml.

For complete information about Forhistal (including dosage, cautions, and side effects), see Physicians' Desk Reference or write CIBA, Summit, N.J.

FORHISTAL® maleate (dimethpyrindene maleate CIBA)
LONTABS® (long-acting tablets CIBA)

# new Forhistal®
# rated better than previous therapy in 7 cases out of 10

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# For the irritable G.I. tract

Milpath acts quickly to suppress hypermotility, hypersecretion, pain and spasm, and to allay anxiety and tension with minimal side effects.

AVAILABLE IN TWO POTENCIES

MILPATH-400—Yellow, scored tablets of 400 mg. Miltown (meprobamate) and 25 mg. tridihexethyl chloride.
Bottle of 50.

Dosage: 1 tablet t.i.d. at mealtime and 2 at bedtime.

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Bottle of 50.

Dosage: 1 or 2 tablets t.i.d. at mealtime and 2 at bedtime.

**Milpath®**

®Miltown + *anticholinergic*

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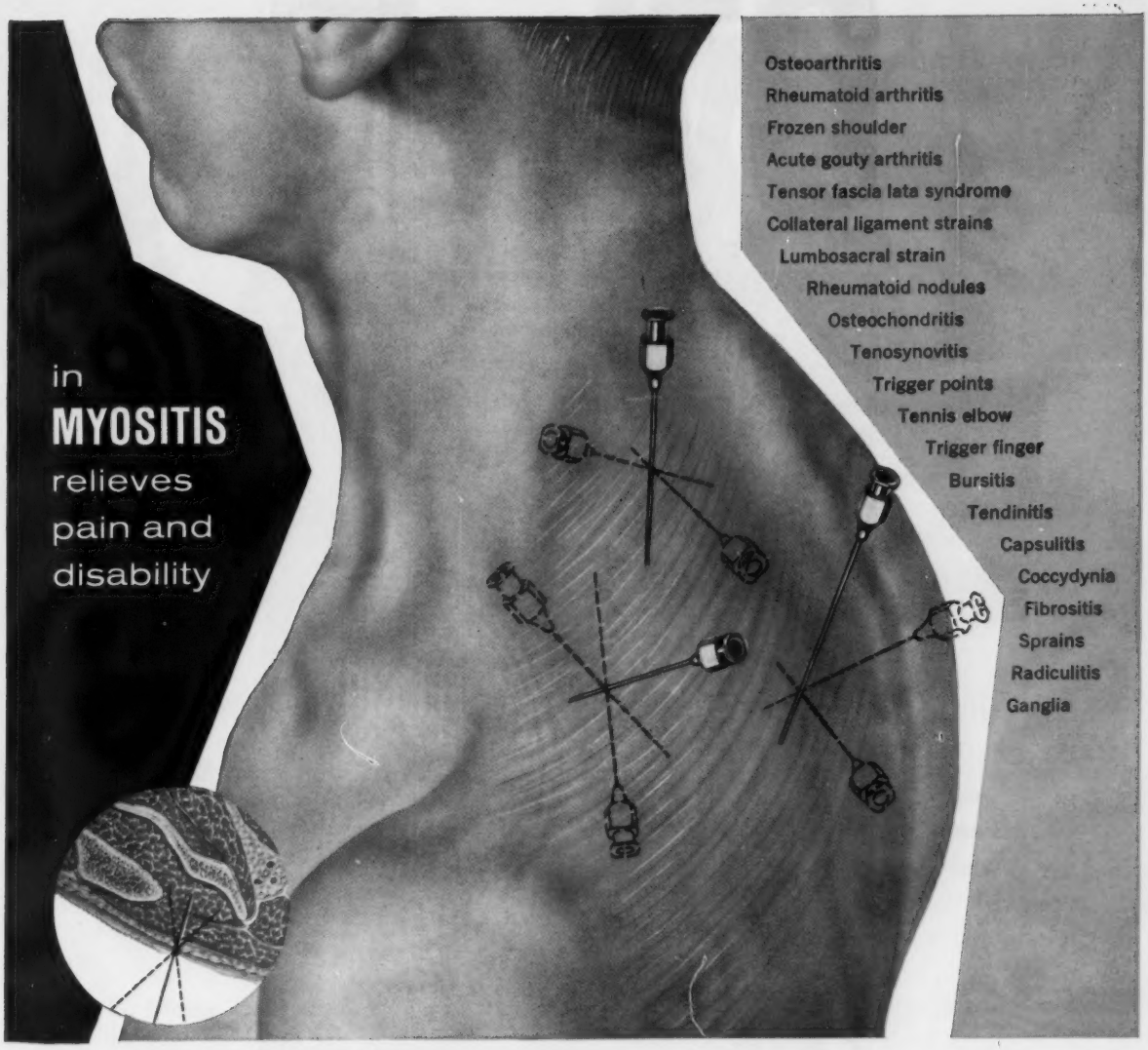


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## CONSISTENTLY EFFECTIVE—PROLONGED RELIEF

**Dosage:** the usual intra-articular, intrabursal or soft tissue dose ranges from 20 to 30 mg. depending on location and extent of pathology.

**Supplied:** Suspension HYDELTRA-T.B.A.—20 mg./cc. of prednisolone tertiary-butylacetate in 5-cc. vials.

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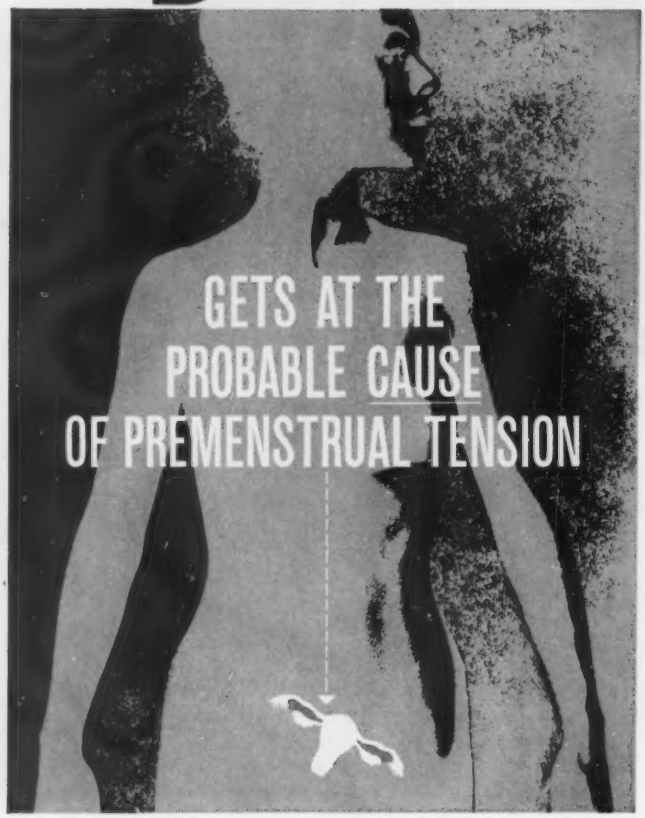


## to restore hormonal balance...

**CORRECTIVE THERAPY** Because Cytran contains the new progestin, Provera*, you can now reach the probable cause of premenstrual tension—hormonal imbalance. The estrogen-progesterone ratio is adjusted to more normal premenstrual balance. Abdominal discomfort, shakiness, fatigue—symptoms incompletely controlled by mere symptomatic treatments—are often effectively relieved.

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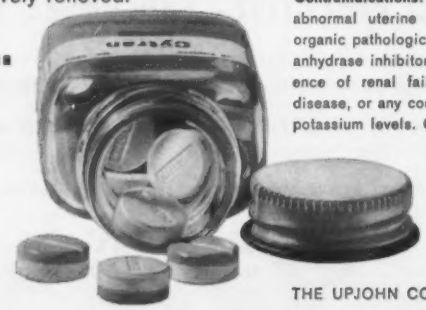
**SYMPTOMATIC THERAPY** An effective diuretic (Cardrase*) and a mild tranquilizer (Levanil*) afford symptomatic relief during the time required to effect basic correction. They also supplement the activity of Provera in those patients in whom restoration of hormone balance does not completely eliminate edema and anxiety/tension.



**Each tablet contains:**

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| Provera (medroxyprogesterone acetate) | 2.5 mg. |
| Cardrase (ethoxzolamide) | 35 mg. |
| Levanil (ectylurea) | 300 mg. |

**Usual dosage:** 1 to 2 tablets daily, 5-10 days before the period.

**Supplied:** As layered tablets in bottles of 20 and 100.

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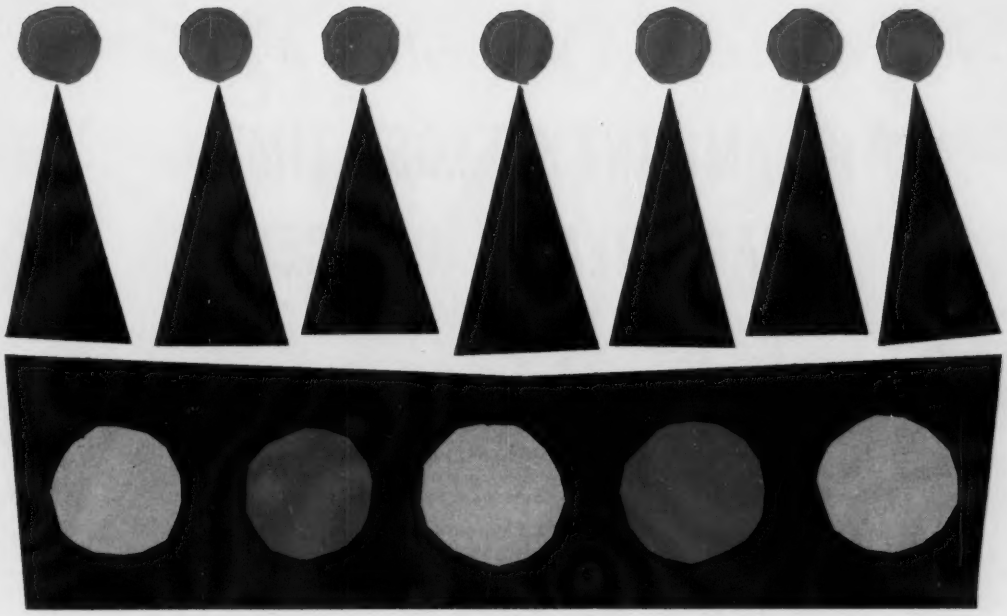

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# "THE AMOUNT OF LOST TIME ...WAS GREATLY REDUCED"

*— reports this industrial physician**

In his recent on-the-job study of pain relief in industrial practice, Murray* observed that:

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**2. Phenaphen is free from side effects** despite its greater analgesic action . . .

**3. Phenaphen is safe for machine operators** since it is free from soporific effects, and thus permits returning to work or driving home with complete safety . . .

**4. The superiority of Phenaphen is shown** by the fact that "the amount of lost time . . . was greatly reduced."*

***Formula:*** Each capsule contains:

| | |
|---|---|
| Acetylsalicylic acid (2½ gr.) | 162 mg. |
| Phenacetin (3 gr.) | 194 mg. |
| Phenobarbital (¼ gr.) | 16.2 mg. |
| Hyoscyamine sulfate (1/2000 gr.) | 0.031 mg. |

***Dosage:*** One or two capsules as required. In industrial practice, Murray noted that "because of the complete absence of side effects, it is justifiable to increase the medication to two tablets every four hours."*

***Supply:*** Bottles of 100 and 500 capsules.

*Dr. R. J. Murray, Medical Dept., Sperry Gyroscope Co., in an article published in the New York State Journal of Medicine, August 15, 1953 (Vol. 53, No. 16).

## PHENAPHEN®

Robins

*— superior analgesic for ambulant patients*
*—"satisfactory for everyday industrial use"**

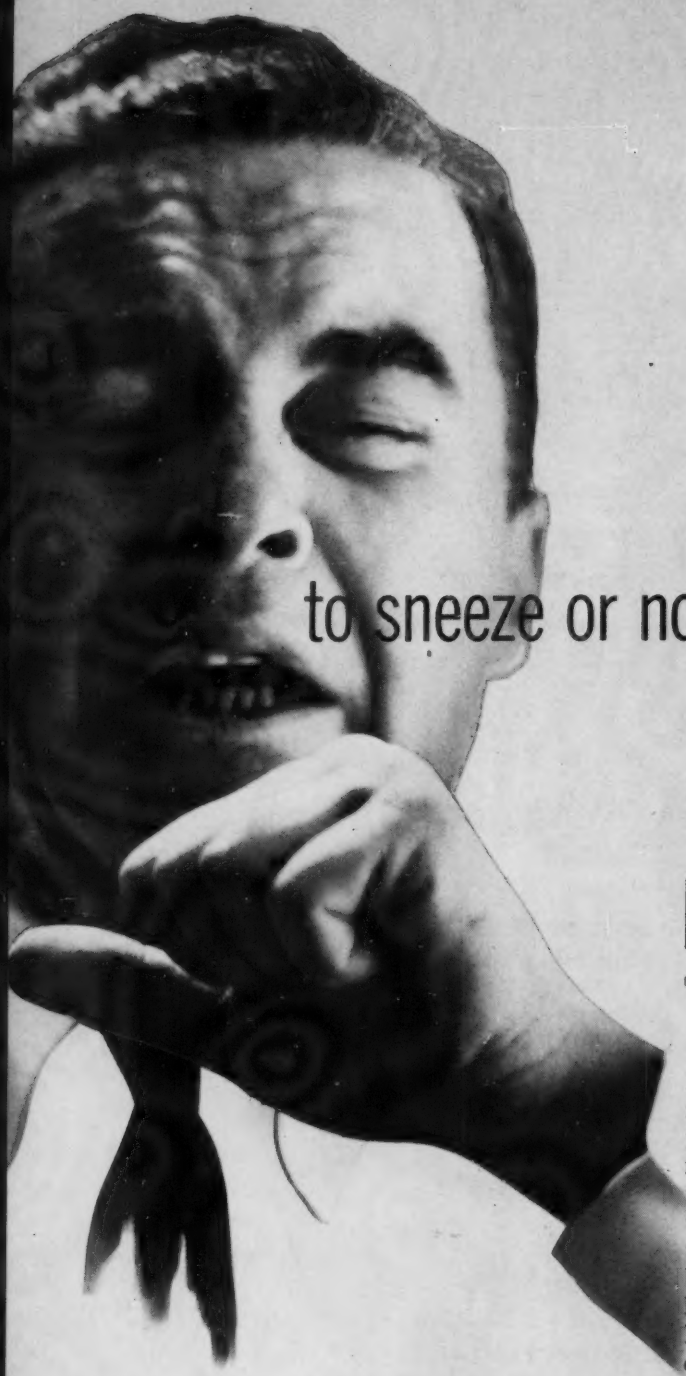
For more severe pain, Phenaphen is also available with varying dosages of codeine added to the basic formula, providing greater analgesia, free from the habituation hazards of addicting narcotics, as:

PHENAPHEN WITH CODEINE PHOSPHATE ¼ GR.
*(Phenaphen No. 2)*

PHENAPHEN WITH CODEINE PHOSPHATE ½ GR.
*(Phenaphen No. 3)*

PHENAPHEN WITH CODEINE PHOSPHATE 1 GR.
*(Phenaphen No. 4)*

**A. H. ROBINS CO., INC.** • Richmond 20, Virginia
*Ethical Pharmaceuticals of Merit since 1878*



Schering

# to sneeze or not to sneeze...

## in hay fever, there is no question

# POLARAMINE

rapid relief of sneezing, tearing, associated symptoms

**POLARAMINE** provides unexcelled antihistaminic effectiveness with minimal dosage for your patients with hay fever. Rapid, effective relief of sneezing, tearing, rhinorrhea, itching and other symptoms helps your patients to "breathe easy" again . . . permits them to enjoy their environment. Patients feel better instead of "dragged out" because sleepless nights are no longer a problem. With **POLARAMINE**, your patients can work, read, engage in sports and other activities without being hampered by the distressing symptoms of hay fever.

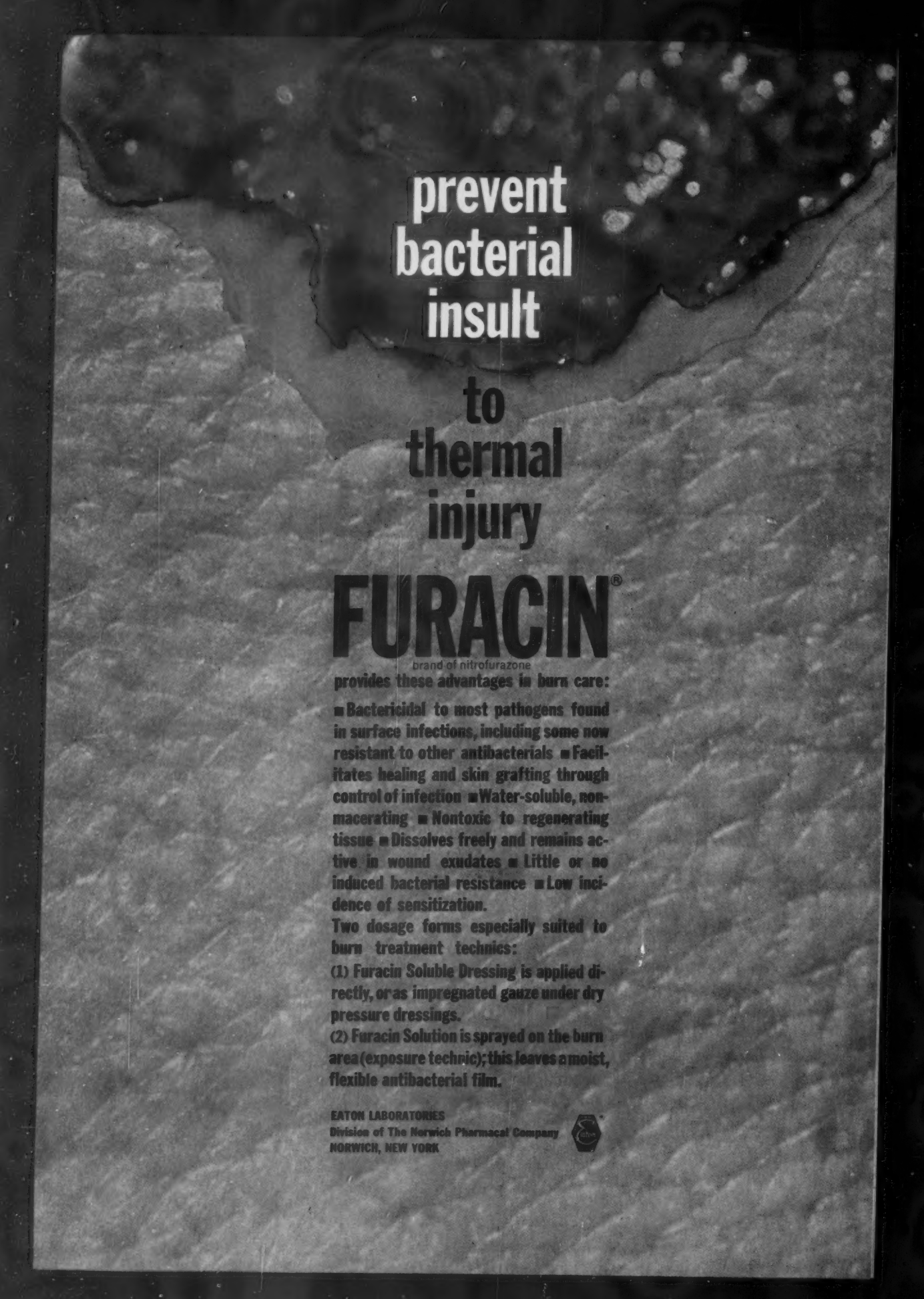
For daylong or nightlong control, **POLARAMINE REPETABS,**® 4 and 6 mg., afford prolonged relief, eliminate repeated taking of medication.

Also available as Tablets, 2 mg., and Syrup, 2 mg./5 cc.

For complete details, consult latest Schering Literature available from your Schering Representative or Medical Services Department, Schering Corporation, Bloomfield, New Jersey.

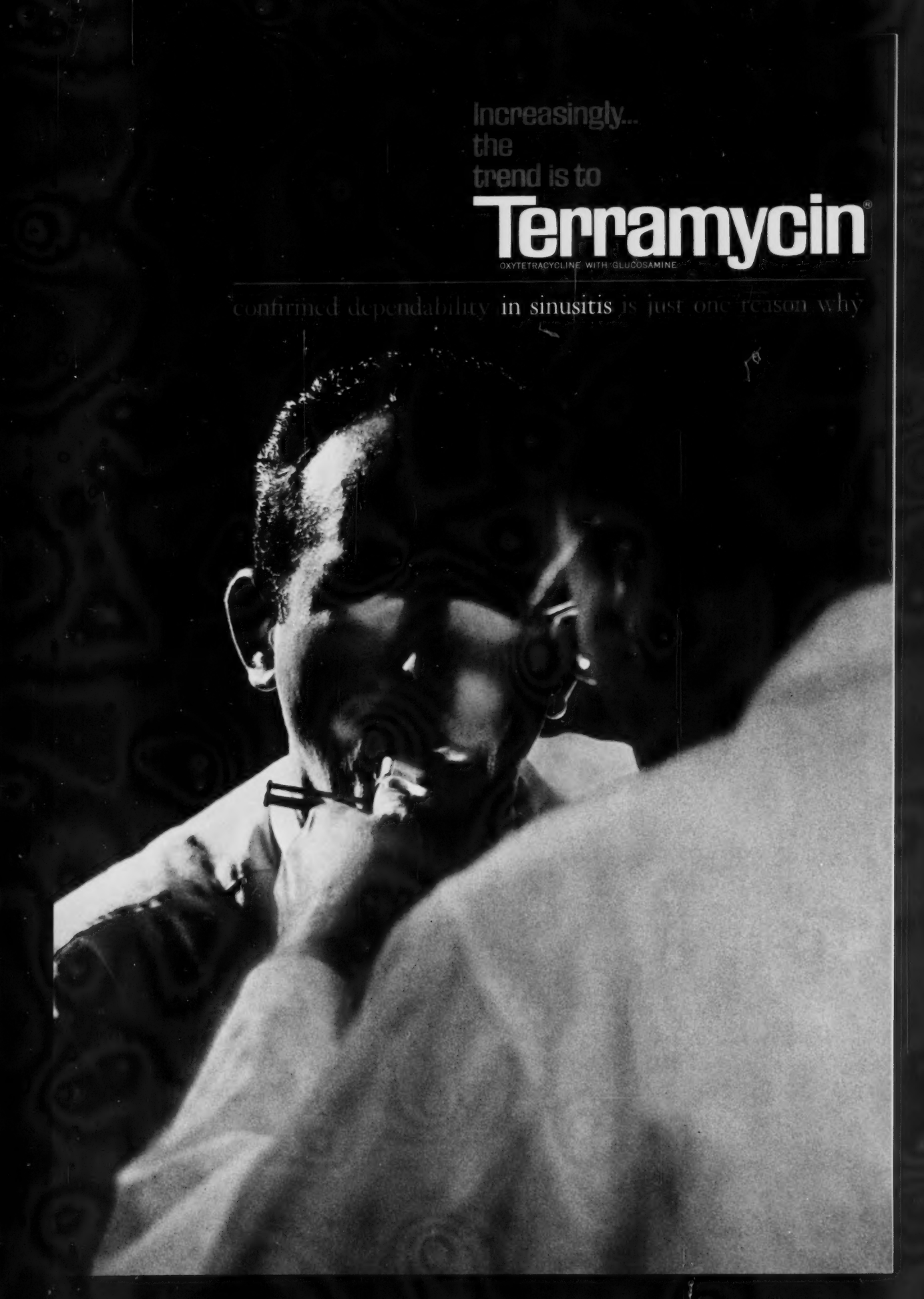
**POLARAMINE**® Maleate, brand of dexchlorpheniramine maleate.

4242


prevent
bacterial
insult
to
thermal
injury
FURACIN®
brand of nitrofurazone
provides these advantages in burn care:
■ Bactericidal to most pathogens found in surface infections, including some now resistant to other antibacterials ■ Facilitates healing and skin grafting through control of infection ■ Water-soluble, nonmacerating ■ Nontoxic to regenerating tissue ■ Dissolves freely and remains active in wound exudates ■ Little or no induced bacterial resistance ■ Low incidence of sensitization.
Two dosage forms especially suited to burn treatment technics:
(1) Furacin Soluble Dressing is applied directly, or as impregnated gauze under dry pressure dressings.
(2) Furacin Solution is sprayed on the burn area (exposure technic); this leaves a moist, flexible antibacterial film.
EATON LABORATORIES
Division of The Norwich Pharmacal Company
NORWICH, NEW YORK

Increasingly...
the
trend is to
Terramycin®
OXYTETRACYCLINE WITH GLUCOSAMINE

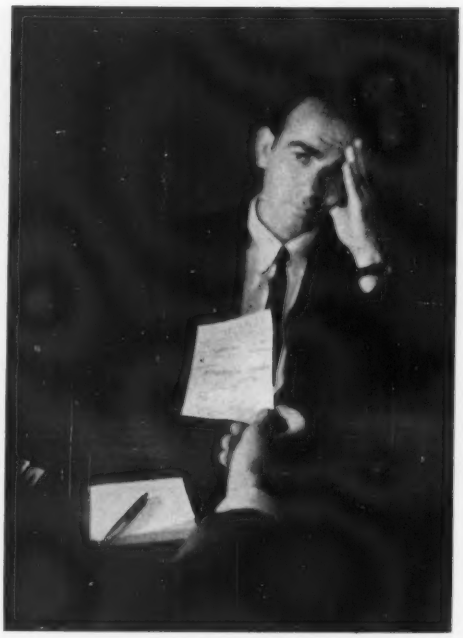
confirmed dependability in sinusitis is just one reason why



According to a recent report* on the effectiveness of Terramycin in 106 cases of upper respiratory tract infection: "The response in sinusitis was particularly gratifying, as both acute and chronic cases were controlled within an average of five days."

"It was the impression of the hospital staff that oxytetracycline [Terramycin] was not only better tolerated, but more effective than other antibiotics habitually used."

The results reported in this and many other studies confirm the vitality of Terramycin for broad-spectrum antibiotic therapy and demonstrate why —increasingly—the trend is to Terramycin.



## In brief

The dependability of Terramycin in daily practice is based on its broad range of antimicrobial effectiveness, excellent toleration, and low order of toxicity. As with other broad-spectrum antibiotics, overgrowth of nonsusceptible organisms may develop. If this occurs, discontinue the medication and institute appropriate specific therapy as indicated by susceptibility testing. Glossitis and allergic reactions to Terramycin are rare. Aluminum hydroxide gel may decrease antibiotic absorption and is contraindicated.

*More detailed professional information available on request.*

another reason why the trend is to Terramycin—*versatility of dosage form:*

**TERRAMYCIN** Syrup/Pediatric Drops
*125 mg. per tsp. and 5 mg. per drop (100 mg./cc.), respectively—deliciously fruit-flavored aqueous forms . . . preconstituted for ready oral administration*

**TERRAMYCIN** Intramuscular Solution
*50 mg./cc. in 10 cc. vials; 100 mg. and 250 mg. in 2 cc. ampules—the broad-spectrum antibiotic for immediate intramuscular injection . . . conveniently preconstituted . . . notably well tolerated at injection site with low tissue reaction compared to other broad-spectrum antibiotics*

# Terramycin®

OXYTETRACYCLINE WITH GLUCOSAMINE

**CAPSULES** *250 mg. and 125 mg. per capsule*

*convenient initial or maintenance therapy in adults and older children*

*Science for the world's well-being®* Pfizer

PFIZER LABORATORIES Division, Chas. Pfizer & Co., Inc.
New York 17, N. Y.

*Jacques, A. A., and Fuchs, V. H.: J. Louisiana M. Soc. 113:200, May, 1961.

Pfizer *Science for the world's well-being®*

Dear Doctor:

Reports from our representatives indicate that many physicians would appreciate simplification for prescription-writing purposes of the names of Terramycin products in both the "plain" and the "Cosa" dosage forms.

The "Cosa" forms originated, you may recall, on the basis of clinical evidence of enhanced antibiotic absorption when glucosamine is employed in oral administration. To permit each physician individually to study this evidence and choose which form he would prefer to prescribe, we offered Terramycin in both forms—that is, in the regular Terramycin forms without glucosamine, and in the "Cosa" forms with glucosamine.

This distinction appears to be no longer necessary since glucosamine, a highly acceptable excipient for oral antibiotics, now is being incorporated uniformly in all such forms, thereby simplifying nomenclature and your prescription writing.

Accordingly, and effective immediately, forms incorporating glucosamine will be offered simply as Terramycin without the "Cosa" prefix.

To make clear just which forms are affected, please refer to the brief tabulation (below) of Terramycin dosage forms both *before* and *after* this change. We are also requesting our representative to call on you at an early date to answer any questions that may arise.

We feel certain that this action, prompted by your comments and those of many other physicians, will simplify your writing of prescriptions for Terramycin products.

We welcome your comments on this action and on any other phase of our operations, since it is our objective to render every service as efficiently as possible to our friends in the medical profession.

Sincerely,
PFIZER LABORATORIES

*The following table indicates the former name and the current name of Terramycin systemic preparations:*

| FORMERLY NAMED | NOW NAMED |
|---|---|
| Cosa-Terramycin® Capsules | **Terramycin**® Capsules* |
| Cosa-Terrabon® Oral Suspension | **Terramycin** Syrup |
| Cosa-Terrabon Pediatric Drops | **Terramycin** Pediatric Drops |

*and simpler names for these Terramycin-containing formulations:*

| | |
|---|---|
| Cosa-Terrastatin® Capsules | **Terrastatin**® Capsules |
| Cosa-Terrastatin for Oral Suspension | **Terrastatin** for Oral Suspension |
| Cosa-Terracydin® Capsules | **Terracydin**® Capsules |

*. . . and these names remain unchanged:*

**Terramycin** Intramuscular Solution
**Terramycin** Intravenous

**Terramycin Capsules* without glucosamine *are no longer available.*

The clinical versatility of Terramycin is enhanced by its specialized dosage forms adapted to individual needs—*another reason for the trend to Terramycin.*

# Put your low-back patient back on the payroll

*Soma relieves stiffness –stops pain, too*

**YOUR CONCERN:** Rapid relief from pain for your patient. Get him back to his normal activity, fast!

**HOW SOMA HELPS:** Soma provides direct pain relief while it relaxes muscle spasm.

**YOUR RESULTS:** With pain relieved, stiffness gone, your patient is soon restored to full activity—often in days instead of weeks.

Kestler reports in controlled study: *Average time for restoring patients to full activity: with Soma, 11.5 days; without Soma, 41 days. (J.A. M.A. Vol. 172, No. 18, April 30, 1960.)*

Soma is notably safe. Side effects are rare. Drowsiness may occur, but usually only in higher dosages. Soma is available in 350 mg. tablets. **USUAL DOSAGE: 1 TABLET Q.I.D.**

*The muscle relaxant with an independent pain-relieving action*

# SOMA®

*(carisoprodol, Wallace)*

Wallace Laboratories, Cranbury, New Jersey

# when allergy looms large in the life of your patient...

BENADRYL provides a twofold therapeutic approach to the management of distressing symptoms of vasomotor rhinitis. ■ **ANTIHISTAMINIC ACTION** alleviates lacrimation, sneezing, nasal blockage, and rhinorrhea. ■ **ANTISPASMODIC ACTION** affords concurrent relief of any associated bronchial or gastrointestinal spasm.

BENADRYL Hydrochloride (diphenhydramine hydrochloride, Parke-Davis) is available in a variety of forms including: Kapseals® of 50 mg.; Capsules of 25 mg.; Emplets® (enteric-coated tablets) of 50 mg.; in aqueous solutions: 1-cc. Ampoules, 50 mg. per cc.; 10- and 30-cc. Steri-Vials,® 10 mg. per cc.; Elixir, 10 mg. per 4 cc.; 2% Ointment (water-miscible base); Kapseals of 50 mg. BENADRYL Hydrochloride with 25 mg. ephedrine sulfate. *Precautions:* Avoid subcutaneous or perivascular injection. Single parenteral dosage greater than 100 mg. should be avoided, particularly in hypertension and cardiac disease. Products containing BENADRYL should be used cautiously with hypnotics or other sedatives; if atropine-like effects are undesirable; or if the patient engages in activities requiring alertness or rapid, accurate response.

**PARKE-DAVIS**

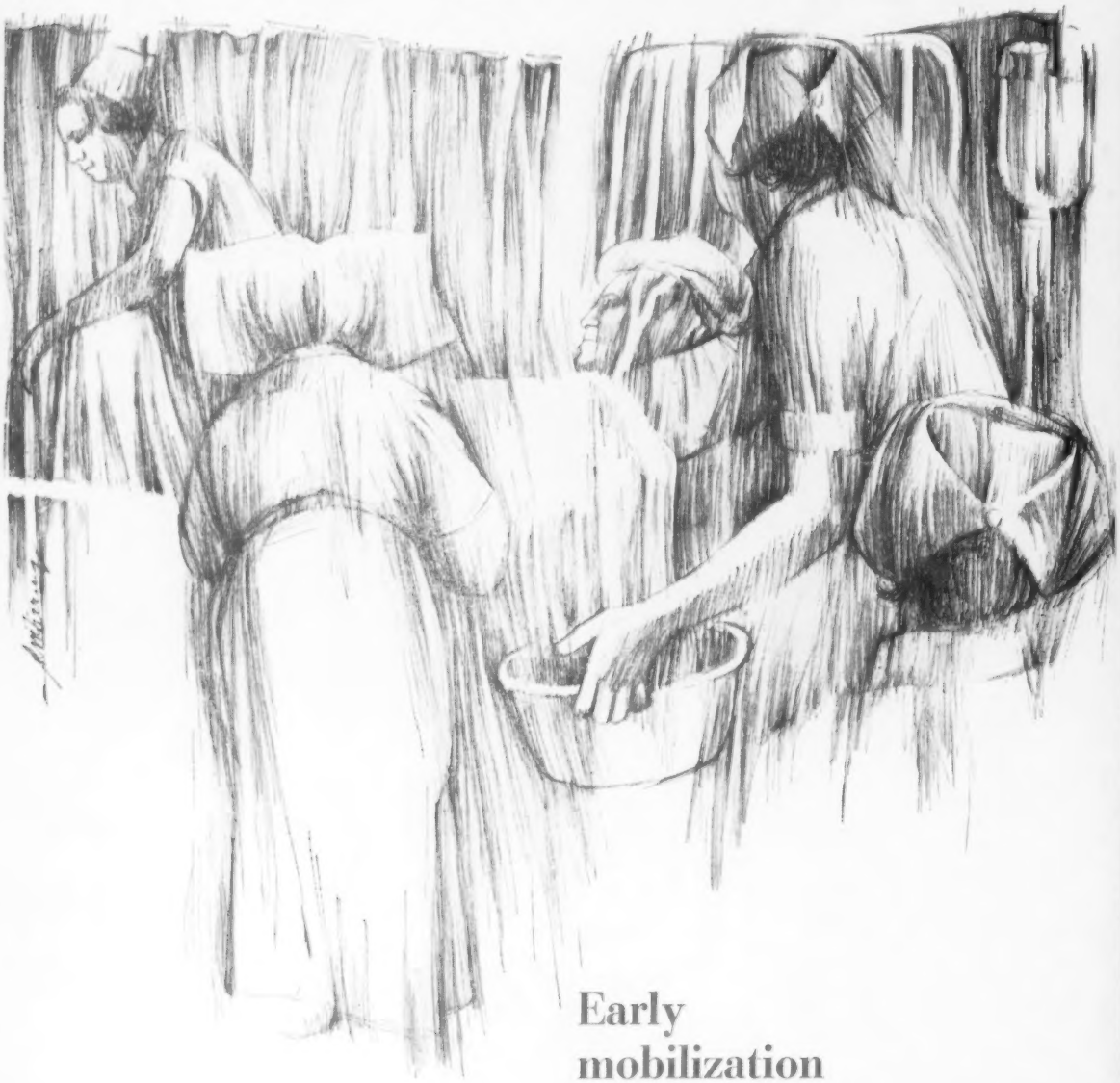
PARKE, DAVIS & COMPANY, Detroit 32, Michigan

# BENADRYL®

antihistaminic-antispasmodic

# CUTS MOST ALLERGENS DOWN TO SIZE!

**THEN** – postoperative analgesia meant lengthy immobilization with more complications and slower recovery.



Early
mobilization
is furthered
with

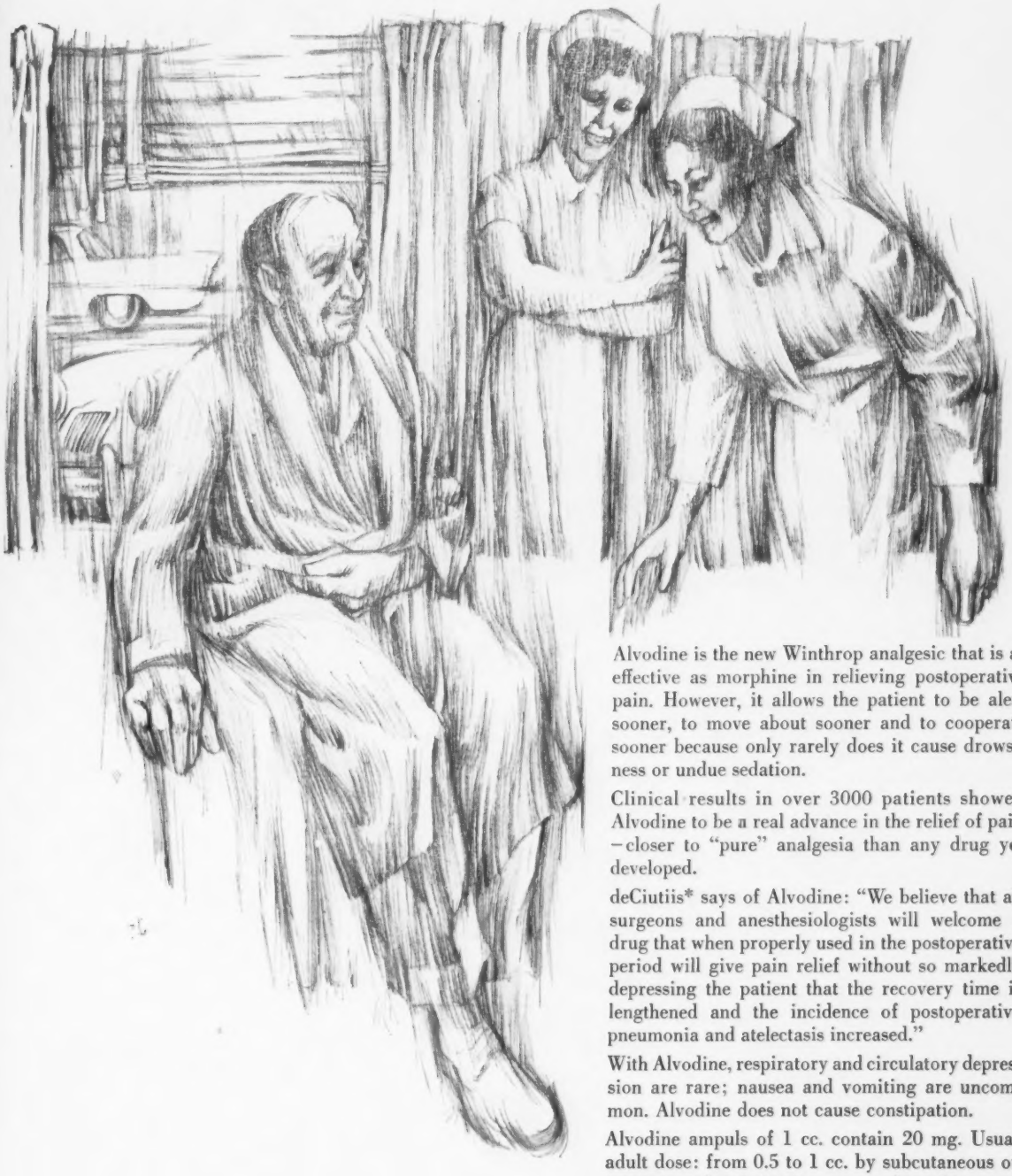
# *new* Alvodine®

ethanesulfonate

Brand of piminodine ethanesulfonate

*postoperative analgesia*
*and alertness*

# NOW —postoperative analgesia usually means early mobilization, faster recovery and fewer complications.



Alvodine is the new Winthrop analgesic that is as effective as morphine in relieving postoperative pain. However, it allows the patient to be alert sooner, to move about sooner and to cooperate sooner because only rarely does it cause drowsiness or undue sedation.

Clinical results in over 3000 patients showed Alvodine to be a real advance in the relief of pain —closer to "pure" analgesia than any drug yet developed.

deCiutiis* says of Alvodine: "We believe that all surgeons and anesthesiologists will welcome a drug that when properly used in the postoperative period will give pain relief without so markedly depressing the patient that the recovery time is lengthened and the incidence of postoperative pneumonia and atelectasis increased."

With Alvodine, respiratory and circulatory depression are rare; nausea and vomiting are uncommon. Alvodine does not cause constipation.

Alvodine ampuls of 1 cc. contain 20 mg. Usual adult dose: from 0.5 to 1 cc. by subcutaneous or intramuscular injection every four hours as needed. Also available in scored tablets of 50 mg. for oral administration. *Narcotic blank required.*

*deCiutiis, V. L.: Evaluation of Alvodine: a new narcotic analgesic, a double blind study, *Current Res. Anesth. & Analg.*, 40:174, March-April, 1961.

Winthrop LABORATORIES New York 18, N.Y.

Alvodine (brand of piminodine ethanesulfonate), trademark reg. U.S. Pat. Off.

# DRISTAN®

## DECONGESTANT TABLETS

*Single Dose Packaging in Sanitary Dispenser*

**for relief of**

- **SINUS CONGESTION**
- **DUST, POLLEN, NASAL ALLERGIES**
- **COLDS DISTRESS**

## Minimizes Hazard of Drowsiness on the Job

as compared with other preparations containing antihistamines

DRISTAN Decongestant Tablets afford *a new degree* of symptomatic relief from sinus congestion, allergic disorders and the common cold. DRISTAN is a special 3-layer tablet development which offers a combination of ingredients never before possible to put into a single tablet releasing:

No Capsule, Single-Layer or Sugar-Coated Tablet Can Duplicate Dristan's Exclusive 3-Layer Tablet Formula.

1. PHENYLEPHRINE HYDROCHLORIDE, a vasoconstrictor to shrink swollen sinus membranes and promote drainage.
2. PHENINDAMINE TARTRATE, a unique antihistamine to control edema and discharge caused by offending allergens. Rarely produces drowsiness.

   Approved APC FORMULA to reduce fever and body aches.
3. VITAMIN C to build up body resistance to colds infection.

## CONVENIENT SANITARY DISPENSER

This Dristan Dispenser contains 50 envelopes of 2 DRISTAN Tablets each. Designed especially for industrial medical use. Economically priced. Available through your regular supplier.

WHITEHALL LABORATORIES
NEW YORK 16, N.Y.

## "makes the rounds" with you

In and out of elevators... up ramps and down corridors... from one room to another... the Sanborn "100M Viso-Cardiette®" goes wherever you need it. Its mobility is matched by its versatility in providing two speeds (25 or 50 mm/sec.), three recording sensitivities, and provision for recording and monitoring other phenomena. Cabinet is handsome mahogany or durable plastic laminate.

For office or laboratory use, the "100M Viso" provides the same instrument in a desk-top mahogany case. And for house calls, the Sanborn "300 Visette®" weighs only 18 pounds complete and can be easily carried by anyone.

No-obligation 15-day trial plan and convenient time payment may be arranged. Contact your nearest Sanborn Branch Office or Service Agency, or write Manager, Clinical Instrument Sales, at the main office.

*Sanborn service lasts long after the sale... from people who know your ECG and value your satisfaction.*

MEDICAL DIVISION
SANBORN COMPANY
175 Wyman St., Waltham 54, Mass.

# six sizes
# a thousand and one uses

The wide range of sizes of 'Vaseline' Sterile Petrolatum Gauze U.S.P. gives it a thousand and one uses in the hospital and the office treatment room. As a pressure dressing in surgery . . . an occlusive dressing in burns . . . an emollient dressing on dry and nonacute skin lesions . . . a packing in nose, eye, and ear procedures . . . here is a dressing that is convenient to use and of guaranteed, sealed-in sterility.

**½" x 72" Selvage-edged Packing**
(in disposable plastic tube)
Packing for nose, ear canal, or eye socket; submucous resection, rhinoplasty, ocular evisceration or other surgical intervention, nasal hemorrhage.

**1" x 36" Strip**
(in heat-sealed foil envelope)
Circumcisions, finger dressings, hand surgery, podiatric applications, small-area burns, pilonidal cysts, small packings.

**3" x 9" Strip, and 3" x 3" Pad**
(in heat-sealed foil envelope)
Skin grafts, colostomies, small-area wounds — traumatic or surgical.

**3" x 18" Strip**
(in heat-sealed foil envelope)
Burns, dermabrasion, traumatic wounds, eschar removal, abrasions, compound fractures, amputation stumps, urological and proctological work, and many other surgical procedures p.r.n.

**3" x 36" Strip**
(in heat-sealed foil envelope)
When a larger dressing is needed for the indications above.

**6" x 36" Strip**
(in heat-sealed foil envelope)
Extensive burns, pemphigus, cancer resections, large-area wounds.

## 'Vaseline' Sterile Petrolatum Gauze U.S.P.

Professional Products Division • Chesebrough-Pond's Inc., New York 17, N. Y.

Vaseline® is a registered trademark of Chesebrough-Pond's Inc.

contains everything most coughers need...

... in each 5 cc. (1 teaspoonful):

Dimetane 2 mg.
(Parabromdylamine [Brompheniramine] Maleate),
the antihistamine most likely to succeed.

Phenylephrine HCl 5 mg. and Phenylpropanolamine HCl 5 mg.,
two highly approved decongestants.

Glyceryl Guaiacolate 100 mg.,
the expectorant that works best –
increases respiratory tract fluid almost 200%.

IN DIMETANE EXPECTORANT-DC
added Codeine Phosphate 10 mg./5 cc.(exempt narcotic),
when additional cough suppressant action is needed.

for less frequent, more productive cough...

# Dimetane® Expectorant
# Dimetane® Expectorant-DC

Robins

Dimetane Expectorant with Codeine Phosphate

A. H. ROBINS CO., INC., RICHMOND 20, VIRGINIA

Lilly
QUALITY / RESEARCH / INTEGRITY

relief from
moderate
postoperative
pain

■ "... *Darvon Compound appears to be an effective analgesic for patients after anorectal surgery when compared with the conventional APC and codeine preparation. A definite advantage is that it is a non-narcotic agent.*"

Zimmerman, K., *et al.*: The Use of Darvon Compound after Anorectal Surgery, Am. J. Surg., *99*:316, 1960.

# DARVON® COMPOUND and DARVON COMPOUND-65

Both products combine the analgesic advantages of Darvon® with the antipyretic and anti-inflammatory benefits of A.S.A.® Compound. Darvon Compound-65 contains *twice* as much Darvon as regular Darvon Compound without increase in the salicylate content or the size of the Pulvule®.

Formulas:

| Darvon Compound | | Darvon Compound-65 |
|---|---|---|
| 32 mg. | Darvon | 65 mg. |
| 162 mg. | Acetophenetidin | 162 mg. |
| 227 mg. | A.S.A.® | 227 mg. |
| 32.4 mg. | Caffeine | 32.4 mg. |

*Usual Dosage:*

*Darvon Compound: 1 or 2 Pulvules three or four times daily.*

*Darvon Compound-65: 1 Pulvule three or four times daily.*

Darvon® Compound (dextro propoxyphene and acetylsalicylic acid compound, Lilly)
Darvon® (dextro propoxyphene hydrochloride, Lilly)
A.S.A.® Compound (acetylsalicylic acid, acetophenetidin, and caffeine, Lilly)
A.S.A.® (acetylsalicylic acid, Lilly)

120250

IMS

# Introduction to this Feature Issue

The Second National Congress on Environmental Health has turned over to *Industrial Medicine and Surgery* the major portion of its manuscripts in order that there may be a prompt partial published record of its activities. This will be followed at an early time by the complete Proceedings in booklet form.

The concept of holding this Congress germinated in the minds of many farsighted individuals who have long realized the impact that an ever changing environment is having upon man and his way of life. A study committee of the American Public Health Association catalyzed the ferment already in formative growth through the Michigan School of Public Health and the National Sanitation Foundation, the originator of the Congress concept. The U. S. Public Health Service gave tangible and comforting support through an appropriation of fifteen thousand dollars. Industry exhibited definite interest and The Paper Cup and Container Institute provided an additional ten thousand dollars. The School and Foundation added several additional thousands. The planning committee held several meetings and soon the Congress was underway.

The purpose of the Congress was (1) to explore environmental resources and their value and usefulness for man in terms of needs for industry, government and conservation, in keeping with health, social and economic trends, and (2) to consider principles and methods of practice which will encourage a maximum development of our environmental resources for society.

With candor, the Planning Committee admits that the Congress did not cover the entire field, nor was this intended. The purpose was to take a broad look at the many facets of the environmental concept of man in relationship to his way of life. No effort was made to examine into technical details, but rather there was an effort to paint in breadth the methods for full and satisfying utilization of knowledge we now possess with continuous reconciliation in practice as new facets are disclosed. It is mankind which must be served. Industry and government are two media through which such service may be sought. Together they may add measurably to the betterment of life. Separately, they may add more to the existing confusion.

The Committee preplanned the sessions in wide sweeps so that there would be general continuity as the program advanced, with repetition at a minimum. The Committee, however, disclaims any endorsement of opinions expressed. These belong only to the individual preceptor. The papers are presented as the authors intended.

The Committee is deeply indebted to those who took time out of their busy schedule to attend, and to the speakers and those who participated in the discussions and summary. The Chairman thanks the Committee members for their untiring devotion to planning and carrying forward the work of the Congress. Without the unselfish contributions from all, the Congress would have proved barren.

After a few months the full Proceedings may be obtained from Continued Education Service, School of Public Health, Ann Arbor, Michigan.

—HENRY F. VAUGHAN, DR.P.H.
General Chairman

*The Second National Congress on Environmental Health*

# The Keynote Address:

• HENRY F. VAUGHAN, Dr. P.H.
President
National Sanitation Foundation

The time has never been more appropriate for industry and government and the voluntary agencies to join hands in a common purpose to review and define needs in health-related activities upon which the future of all of us in no small way depends. The blessings of modern industry with the advancing frontiers in engineering, chemistry, and physics are well accepted. The pace in this direction, however, outstrips the adjustments of man to his environment, and in this process there is need to avoid self-destruction. This conference has an important part to play in such effort.

This meeting provides an unbiased forum where industry, government, and the public can join hands without the embarrassments that normally interfere with an understanding, cooperative and objective resolution of each new health-related problem as it is presented. It is much easier for government to tell industry and the public what is needed in the health field, than it is for industry and the public to tell the government what each is to do. It is easier to do things to and for people than with people. But if democracy is to survive, if science and industry are to continue to give us the advantages of a more economic, healthy, and pleasing way of life, it is through the people with industry and government that these goals will be met. This congress presents this opportunity to the maximum.

## Recent Background

The official public health program began in this country about one hundred years ago. The beginnings were primitive in character, unsupported by the knowledge of bacteriology, biochemistry, and physiology. Born of the necessity of survival, man's environment — the water, food, milk, and waste problems — became a prime consideration. Water, land, air, and sunlight constitute the four basic ingredients for all life on this world. Man long ago chose to become a part of a social institution which increasingly exposed him to biologic and physical hazards with ever-present sickness and early death. With man living more frequently in a community environment, the problems of a safe water and food supply became more apparent. Systems for filtration and gross treatment helped prevent the spread of typhoid fever, cholera, and other water-borne diseases. Results were encouraging but not conclusive.

Later, with the newer approach through an understanding of the bacterial and viral relationships to the cause and spread of the communicable diseases, further progress was made. Then with the arrival of appropriate preventive procedures, vaccines, and antibiotics, the first phase of the adjustment of man to his environment came to a successful close. The communicable diseases still require constant surveillance, but, generally speaking, the protective services (such as vaccination, early diagnosis and prompt treatment, for the individual, and control of the environment) will keep out the devastations of typhoid, malaria, tuberculosis, polio, and other pestilential disorders.

As a result of the elimination of these noxious diseases, the span of human life has increased until the average man can expect to reach the mature age at which he becomes the object of chronic disease. The relative parts played by heredity and environment in the increasing prevalence of heart disease, cancer, mental disorders, accidents, and other embarrassments of an aging population, still remain unknown. On one point, however, we are quite sure; the changing environment is having an impact on man's health status. We must conjure with the syn-

*Ann Arbor, Michigan • June, 1961*

# Purpose of the Congress

Dr. Vaughan was Health Commissioner of the City of Detroit from 1918 to 1941, when he became the first Dean of the Michigan School of Public Health. A past president of the American Public Health Association, he has devoted nearly fifty years to problems of public health practice.

thetic chemicals, the newer processes of industry and agriculture which, essential as they are to our new economy and pattern of life, introduce new health hazards toward which we must direct an intelligent front.

As Americans we are proud of and love to talk about the American way of life. It is a free life for the most part, abundant in terms of food, water, air, soil, and shelter. However, this free, abundant, and progressive life is not without its price. Industry, conservation, wildlife devotees, recreation, water power, drainage authorities, and others are fighting keenly for command of these natural resources. Their wants and needs are not altogether compatible with each other or with public health needs. Compromises and reconciliations must be made.

## Trends

An ever-increasing population with a continued tendency to move westward and from farm to town, to city and back to suburbia, and eventually to exurbia, together with the impact of modern transportation and communications, augmented by scientific advancements in industry accompanied by a changing social and economic status, presents new problems, as well as old problems with a new look, disclosing new aspects of man in relationship to his environment. This rapidly changing complexity of our modern day community results in impacts upon people, emphasizing the need for a total program in environmental control and environmental health.

The increase of population and mobility, together with the trend to live, work, and play in metropolitan centers, grossly aggravates the environmental health problems related to air, water, and land use. By 1970, it is anticipated that the population of the United States will be about 214 million. Already one half of our people live in 192 metropolitan areas that include less than 10% of the land area. The trend to concentrate in such areas increases year by year, with resulting critical insults on the health of man and conflicting use demands upon our environmental resources. These insults must be constantly reviewed in terms of social, economic, and psychologic advantages afforded by an ever-changing way of life.

In the past, the healthmen, and especially the men of sanitary science, have made noteworthy contributions to the protection of public health, especially by protecting the water supply and by providing means for waste disposal. Adjustment between man and his fellow man and the environment has, since the beginning of this century, contributed to the extension of life expectancy at birth from 47 to 70 years. However, today and tomorrow the problem of adjusting the environment to the socioeconomic needs of man is vital to society, to survive and to thrive.

New problems seem to be developing as a result of (1) a rapidly increasing population and population movement, travel, and recreation, (2) an expanding industry frequently located in the more rural areas, as well as industrial corridors, (3) an increasing life expectancy, (4) a mounting pollution of air and water, including that caused by radiation, (5) a growing demand for enriched and exotic foods, (6) the use of antibiotics and chemicals in the growing, processing, and marketing of foods, and (7) the constant general development of new materials, equipment, and processes which have a relationship to environment and which may, or may not, be beneficial to health. Most of these trends and new problems come as a result of man's expanding knowledge.

As a result of past accomplishment, the public

places a higher value on health achievements, and has a better understanding of how the environment impinges upon its health and well-being. The development of the new social order demands emphasis on the part played by the voluntary health agency as well as the official agency and free enterprise.

There is a trend toward raising standards and expectation in health matters. The human being differs from the animal in his ability to reason, and it is through this characteristic that we are able to adapt ourselves to biologic, physical, and social changes. While it is true that animals and plants give evidence of adjustment to antibiotics and pesticides, man can go beyond this in determining and shaping the characteristics of the soil, water, and air with which he must live.

## Problems

While new programs and adjustments of old ones must be based upon research and a discerning view of factual data analyzed for significance as to possible health problems, we must definitely have a program that is practical from the standpoint of carrying the fruits of research through to the benefit and protection of the American public. There must be a way for people to participate directly and feel that the program is for them, and not merely a controlled program for a few people.

The total environmental health program, to be implemented successfully, must embrace the resources and facilities not only of the official health agencies, but of the voluntary agencies, industry, labor, and the public at large, all utilized on a self-planned and self-integrated basis. The ultimate purpose in environmental health control is not merely the absence of disease or death, or even the absence of a depth and breadth of filth; it is the fuller life to be had by all people, one in which all may benefit from the program, one in which we increasingly shape the environment for thriving, not merely surviving.

Without cooperation between government, industry, and conservation in the development and use of environmental resources and services, surely chaos and destruction of our way of life together with its advantages will ensue. To survive we must submerge our personal and collective desires to a democratic approach of teamwork wherein all may work together toward the goal of compatible living. This we must do without destruction of freedom which sets the pattern of American life. Big government and Federal paternalism are not the answer. There is constant juggling of opinion as to the relative part that government and industry must play. Both have the same ultimate objective by emphasizing the positive and most important factors in maintaining a high level of human health and culture.

The perfectly adjusted balance between the needs of all who draw heavily on environmental resources is difficult of attainment and extremely complicated in measurement and evaluation. There must be mutually acceptable positions on a common yardstick which will permit us to exist and prosper in our changing complex environment. What are the most important points on this scale? One must consider low cost in keeping with health and social needs. Science and research will give us some significant points on this yardstick. Other values may be reached through a pooling of group judgment. Gross extrapolations from current knowledge must be made for want of definitive research. Practice marches along in keeping with knowledge of the day.

In the environmental health field there is dire need for concurrent evaluation and reconciliation of new knowledge with health practices. Advance in research is well ahead of the means in interpretive practices designed to eliminate the obsolete and take advantage of the new.

Man continually manipulates some factors in his environment to favor health conservation; the production of goods and services; and the satisfactions of his recreation, leisure, mental composure, and stability in a positive and fruitful way of life. A discordant environment is not conducive to one's internal peace. No one has an inherent right to do as he wishes with his surroundings. Where water, air, and soil are used to serve production, health, economic, and social needs, it seems desirable to return them to their former quality as near as is economically possible. Realistically, some sacrifices and compromises must be made so that society may obtain the goods and services it desires, but these sacrifices must not be inimical to health and the common good. Judgment is governed by social and economic benefits as well as health needs.

Man's environment is measurably influenced by new additives which science is introducing into today's life. These new additions are not only for food, but for water, air, and soil. We cannot do so well without these additions, but we must, at all costs, avoid exposure to additives that are proved incompatible with personal and public health. The problem becomes complicated since there may be no arbitrary level that can be agreed upon below which there is proved safety, and above which there is a definite hazard. Much depends upon the tolerance of the host and the time, magnitude, and conditions of

exposure. There must be a balancing of social and economic benefits against the risks engendered by biological, chemical, physical, and radiological hazards.

The human body is an assembly of chemicals that must be kept in harmony with the additions and subtractions which accompany every chemical reaction. The objective is to prevent strong and adverse poisons, in the form of additives, from becoming a part of the human assemblage of chemicals, through introduction via food, water, air, radiation, or other means.

There exists a need to evaluate the relative urgency of dealing with problems that present themselves at different points on the spectrum. To give equal emphasis to all spells denial to many accepted advantages of a social and economic way of life. To forego the blessings of community life, modern agriculture and food production, processing, and distribution, with its insecticides, weedicides, fungicides, and food additives, spells a reversion to a way of life known only to primitive man. Modern motor transportation with its noxious gases and fumes would be abandoned in favor of the mule and horse age. Bread would be brown and black, not white. Fresh fruits and vegetables would no longer be found in the market place in all seasons. Enriched and fortified foods would no longer appear on the breakfast table. Sanitary packaging would be forbidden. How essential it becomes to appraise the relative health, social, and economic factors in a constantly changing environment! Exposure in excess to practically any component of the environment may prove harmful to a test animal or inimical to human health. However, this does not constitute prima facie evidence that we should forego chlorination and fluoridation in small amounts to kill bacteria in public water supplies and to prevent dental caries.

## Public Health

It is the obligation of government to assist the individual and groups, in communities and in industry and agriculture; and the many dedicated to maintain the dignity, the leisure and the comfort of man, insofar as the individual and groups cannot operate effectively by themselves. Herein, public health through government becomes a must. Manpower is the basic resource of industry. The control of tuberculosis and other plagues, the quality of food, water, and air, the suppression of unwanted radiation and noxious pollutants, determine the availability of manpower with which to produce the goods upon which our mode of life depends. Surely, public health is the recognized umbrella under which all other needs are sheltered and spawned.

Public health practice remains always in a state of flux. It must be flexible, and constantly reconciled to the newer knowledge of health control and to the changing demands of a dynamic society. The environmental practices now in use are for the most part antiquated and unsuitable for today's program. They remain arbitrarily attuned to a nuisance and law enforcement concept of yesteryear. They are steeped in the prompt and despotic decision of the few who were awarded great discretion at times of impending pestilence. There is need for review of sanitary practices in terms of advancing education and a new economic and social order.

Acceptable standards for absolute safety may be wanting for many years. The expanded dollars and personnel for basic and applied research will ultimately provide some of the answers. In the meantime, however, we must be realistic and find ways of exercising group judgments that are not restricted to technical and research considerations. Certain assumptions based upon good and accepted practices may well establish reasonable guide lines until additional research provides the new knowledge so badly needed. The march of progress will not stand still for a single day.

## Methodology

The American way of life depends upon a freedom of choice and a recognized liberty for the individual consistent with the public good. Free enterprise in industry is essential to the support of government to do what the individual cannot accomplish by himself. However, the individual engaged in production of goods and services who neglects the social, economic, health, and welfare trends leads us down the pathway of destruction and possible anarchy. Government is a citadel through which the dignity of man may be expressed. Understanding cooperation, activated by performance, between industry and government can resolve many pending health, social, and economic problems within the framework of current knowledge. This conference is designed to take a hard look at some of these problems. Discussion is essential, but we need something more; we must have action and maybe we can get it.

The Second National Congress on Environmental Health assembled at the School of Public Health of the University of Michigan in Ann Arbor on June 6-8, 1961. Two hundred participants shared in this Congress. This number included public officials, members of the public health professions, industrial physicians and hygienists, and industrialists. The general chairman of this Congress was Dr. Henry Vaughan, President of the National Sanitation Foundation. The sponsors of the Congress were the School of Public Health, University of Michigan, The American Public Health Association, and the National Sanitation Foundation. In part the Congress was supported financially by the National Advisory Health Council of the Public Health Service, and the Public Health Committee of the Paper Cup and Container Institute.

# Man and His Environment

## A Conference Resumé

• CAREY P. McCORD, M.D.
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At all times every organism is the center of a ring of external conditions, forces, objects and influences that affect its life and development. The aggregate of these surroundings constitute that organism's environment. The human organism is no exception. The first man to appear on earth and every one that succeeded him was born into an orb of externals that contributed to his total life. Those externals, ever changing, make up man's environment. That environment may be friendly and salutary or it may be hostile and threatening. Inevitably that environment is an interfusion of the good and the evil. Always man has engaged in struggle with the harassing portion of his environment.

Primitive man quickly became aware of threats from the natural environment in which he found himself. He faced heat and cold; wild beasts and insects; noxious plants and unfit food. Fear stalked his life and anxiety became part of his being. It is fully speculative to contemplate what early man's first efforts to control the affronts from his environment may have been. The wearing of clothing may have represented a timely measure. But long before man was garbed it may be believed that he sought to rid himself of dangerous wild beasts. Man's struggle against his natural environment long ago was set into action.

All unwillingly and all too soon man began to add his own threats to his environment. One of his first acts of detriment was the building of his domestic fires deep within the cave that was his home. Man made the alarming discovery that fire is a foe as well as a friend. From the beginning one of the commonest threats to health in man derived from the products of combustion. Perhaps the first victory over the environment came about when our gas-ridden progenitor learned to build his fires just outside his cave entrance.

In time man has brought about, but not as an achievement or contrivance, the pollution of the water about him, the air above him, the food required in his survival, and the workplace where he gains his livelihood. He has fouled his days and nights with man-made dins of noise

and fouled his world with his greatest destructive accomplishment, an instrument that we call war. Man, the greater ravager, has added sully to his own environment.

The crux of the impact of the environment of human beings comes to life in these words not precisely quoted:

> One can define disease as that alteration of living tissues that jeopardizes their survival in a given environment. There is a lot to be said for that definition because it introduces into the definition of disease the notion of environment and also the notion of survival. One can say that a disease of man or of an animal is a maladjustment. It is an inability of a living thing to survive in a given environment, and medicine is the art of improving or healing this condition of the tissues and allowing adjustment in the environment.
>
> Now, how does this maladjustment occur? It can be summed up as follows: no disease ever occurs without a stimulus from the environment and a response from the tissue. This is true of the transmissible, the degenerative and also the behavioral diseases. The basic concept is that disease in individuals and in populations, human or animal, occurs only when stimuli from the environment elicit responses from the host. The stimuli are easily demonstrable to be geographical in nature and to vary region by region. Responses, of course, are under the control of the genetic forces, about which so far little is known. The point here will be to show that the genetic forces also are much conditioned by the geographical environment, which means that the two ends of this equation that creates the disease pattern are both conditioned by the environment. In between the environmental stimuli and the response of the living tissues stands, as far as man is concerned and perhaps also as far as animals are concerned, what is called culture, which either brings together the stimulus and the host or keeps them apart. (Jacques May)

It follows as a corollary to the foregoing that health in human beings is that state in which biologic tissues receive no stimuli from the environment that threatens function or survival. Health is a state of full adjustment between biologic tissues and the environment. Health will continue so long as this adjustment prevails.

From the beginning, suffering man has rushed to those he regarded as his superiors, demanding protection against his frightening environment. The first shaman worked his feeble wonders, and all succeeding generations of shamen have made their contributions. A far more heartening story than this dour one which is dedicated to "what remains to be accomplished" might be directed to those marvels brought about by men of science in safeguarding man from the onslaughts of his environment. It is no casual note to observe that if all that science has accomplished in medicine, sanitation and hygiene, were wholly abandoned, the seed of man's full annihilation would appear in one week's time. The fact this has not been allowed to come to pass is man's mightiest health story.

Fortunate modern man in modern states has as one of his blessings, an environment in which public health is an integral element. This benevolent part of the environment consists of an array of institutions and agencies, public and private, operated by men and women of skill and good will, and armed with equipment and procedures of precision. These men and these facilities are devoted to the promotion of all that is wholesome in the environment and the subjugation of all that is detrimental. The singular and perhaps the most striking difference between the environment of remote man and his recent counterpart is that now public health, itself, is a part of the environment.

Then nothing passing strange may be found in the boxed-in paragraph that marks the opening of this appraisal. Since this is the story of those sessions, it becomes a requirement to provide more as to its programs, its trends, its pronouncements, its conclusions and its asides.

### Purpose and Goal

The purpose of the Congress was to explore environmental resources and their value and usefulness for man in terms of needs for industry, government, and conservation — in keeping with health, social, and economic trends: to consider principles and methods of practice that will encourage a maximum development of our environmental resources for society.

The goal of the Congress was to explore and develop environmental concepts and principles, methodology, and practice that will encourage maximum health and the orderly development of our environment for the needs of society. Team work among those who participated in the Congress, seasoned by intelligent determination and rugged individualism, may contribute materially to the American way of life.

## The Scientific Program

*Welcome*—MYRON WEGMAN, M.D., Dean, Michigan School of Public Health.

*Keynote Address*—HENRY F. VAUGHAN, DR.P.H., President, National Sanitation Foundation.

*Man Versus Environment*—RENE DUBOS, PH.D., Rockefeller Institute.

*Biological Aspects of Environment*—THOMAS FRANCIS, M.D., Professor of Epidemiology, Michigan School of Public Health.

*Chemical Aspects of Environment*—ROBERT A. KEHOE, M.D., Director, Kettering Institute, University of Cincinnati.

*Physical Aspects of Environment*—ABEL WOLMAN, DR. ENGR., Professor of Sanitary Engineering, Johns Hopkins School of Public Health.

*Social and Economic Factors Influencing Environment*—JOSEPH J. SPENGLER, PH.D., Professor of Economics, Duke University.

*A Public View of Man Versus Environment*—HON. JOHN E. FOGARTY, DR. POL. SCI., Congressman from Rhode Island.

*Environment Needs for Industry*

*Basic Needs*—WALKER L. CISLER, DR. ENGR., President, Detroit Edison Company.

*Applied Needs*—DWIGHT L. STOCKER, B.S., President, K.V.P. Sutherland Paper Company.

*More Applied Needs*—ALEXANDER M. TURNER, A.B., President, Owens-Illinois International.
H. A. BARNBY, M.S., Director of Packaging Research, Owens-Illinois.

*Needs in Food Industries*—CHARLES GLEN KING, PH.D., President, Nutrition Foundation and President-Elect, American Public Health Association.

*Needs for Conservation*

*Conservation*—STANLEY A. CAIN, PH.D., Professor of Conservation, The University of Michigan.

*Recreation*—H. AYERS BRINSER, PH.D., Professor of Economics, University of Colorado.

*Agriculture and Related Land Resources*—EDWARD A. ACKERMAN, PH.D., Executive Officer, Carnegie Institute of Washington.
MARION CLAWSON, PH.D., Director Land Use Program, Resources for the Future.

*Community Planning*—ROBERT HOWES, B.L.A., Director, Reservoir Properties.
A. J. GRAY, M.A., Community Planner, Tennessee Valley Authority.

*Needs for Health*

*Public Health*—HERMAN E. HILLEBOE, M.D., Health Commissioner of New York State.

*The Federal Government*—JOHN PORTERFIELD, M.D., Deputy Surgeon-General, U. S. Public Health Service.

*Foods and Drugs*—HON. GEORGE LARRICK, D.SC., U. S. Commissioner of Food and Drugs.

*Methodology*

*Freedom: The Cornerstone of American Life*—ALBERT C. JACOBS, LL.D., President, Trinity College.
*Methodology for Industry*—F. K. DOSCHER, Vice President, Lily-Tulip Cup Corporation.
*Methodology for Government*—LEONA BAUMGARTNER, M.D., Health Commissioner, New York City.

*Free Enterprise and Methodology in The American Way of Life*

Discussion led by: ROBERT J. ANDERSON, M.D., Deputy Chief, Bureau of State Services, U. S. Public Health Service.
DONALD GREENAWAY, Exec. Vice-President, National Restaurant Association.
MARK HOLLIS, C.E., Chief Engineer, U. S. Public Health Service.
DON NICHOLS, Publisher, Ahrens Publishing Company.
WALTER F. SNYDER, Director, National Sanitation Foundation.

### The Composition of the Congress

The diversity of professional attainments of the 200 persons in attendance is illuminating as to the ubiquity of concern over man's environment. An analysis indicates the participation of sanitary engineers, industrial physicians and hygienists, industrialists, Federal public health officials, state and city public health officials, conservationists, nutritionists, representatives from other universities in various fields, together with representatives from several University of Michigan colleges.

At once it becomes engaging to inquire if any particular group of scientists rightly may be regarded as the captains in the pursuit of control of the unwanted environment. On the basis of early performance the medical profession might lay claim to this post. Physicians were confronted with the end results of a damaging environment. Physicians saw cases and epidemics. Working backward from the case to the cause, physicians in the early days, more than any other group, detected the precise agents of destruction harbored in the environment. They were the "sanitarians" — a term now of low estate. Yet the medical profession has staked no claims over the environment, and in many respects, more the pity.

One core of control over the threatening environment is to be found in mechanics, methodology, and techniques. That is the territory of the sanitary engineer. In a just sense, much of the environment belongs to this branch of science. These engineers have wrought mightily and for what they have wrought they have won unstinted praise. Semantics has muddled the boundaries of sanitation. Earlier all was exact as to who was a sanitarian and what was sanitation. Sanitation dealt with inanimate things. Hygiene dealt with the person. All was clear when reference was made to the hygiene of the bath but the sanitation of the bathroom. The term "sanitary napkin" is an affront to good language. Most of the activities of the industrial hygienist in the work environment is sanitation. Foremostly he deals with things. More appropriately he might have been styled the industrial sanitarian or better the industrial sanitary engineer when so qualified. It follows, if the sanitary engineer is to occupy a stellar role in the control of the environment, the industrial hygienist must be an essential part of that stellation.

The epidemiologists are the universalists in science. They accept no boundaries to their theater of action. Disease epidemics are a major product of the harmful environment and always this has been true. Likewise epidemiology itself is a product of the environment. By its very nature epidemiology is an essential portion of any and all explorations of the environment as sources of onslaughts of the environment on man and all other biologic forms.

Currently the real presider over the exploration of the environment in man's behalf is the politician, who would prefer to be called the statesman and sometimes is. Public health activities involve risks, economics, monies, and sanctions. The politician ties and unties the knots of many purses. Happily health has captured the imagination of these statesmen. Happily again, they make clear that monies will be provided for many laudable efforts to protect the people who are or who may become the victims of an inimical environment.

To these major disciplines that reckon with environment must be added others scarcely less important but distinctly more restricted. These additions represent no newcomers but do represent new recognitions. There stands the nutritionist, rightly concerned over adequacy of food and its purity. Alongside him stands the conservationist who deplores the encroachment of an exploding population upon the land's native resources. With pertinency he inquires as to what may happen when the wide expanses now given to grazing and pasturage for food animals will become the city lots and the automobile expressways of the millions.

There need be no astonishment that industrialists shared in this Congress. Even the little initiated are aware that work environments long have constituted a veritable Pandora's box from which have poured hazards to health in endless fecundity.

All these diverse groups shared in the Congress and contributed to it. The answer to the rhetorical question as to what professional group should be assigned the control over the environment, is that the environment in its enormity and its diversity and its significance to health is too tremendous to warrant any exclusive assignment.

### The Ever-Changing Environment

This Congress was hampered to the extent that some of its participants appeared to accept the environment as a fixture, a static state, as stable as the dome on the Capitol. Actually the environment is as fluid as a gas. The environment changes moment by moment. Moreover, no two humans ever possessed the same environment; nor does any one individual possess the same environment for any long time.

It is convenient to make use of the term "the total human environment." Yet that term is meaningless in the absence of realization of as many different environments as there are per-

sons, all with thousands of elements, and all subject to a biologic form of Brownian motion. Blindness is at hand when in the environment nothing more is seen than water, air, food, sewage, work, houses, and misplaced atomic energy.

Convenience and action is served by the recognition of many subdivisions and categories within the total environments. Much is grasped by reference to the physical environment, the work environment, the home environment, the political environment, the social environment, and the psychosocial environment, among others. Semantically speaking, there is no mental environment any more than it is semantically proper to refer to environmental health or industrial tuberculosis. Yet from the environment, immediately or remotely, spring all mental and emotional diseases. One of the tasks in the pursuit of a benign environment is to procure a more exact terminology.

Change itself is part of the environment. Over and over physicians and laymen may be heard to say, "What you need is a change." That such may be a boon may not be denied. Many forms of change and even trivial changes are demoralizing. Human beings resent change and in particular quick change. Let any factory for sound reasons move to another locality to a new and better building and better machines but taking along the same work force: inevitably human disorder will arise. Neuroses, emotional disturbances, behavioral alterations will appear despite a manifestly superior physical environment. More importantly and beyond ready explanation, the incidence of organic or at least psychosomatic disease will increase.

In one factory an emergency task arose calling for weeks of rush production. A group of women was assigned this duty, and these women succeeded admirably. An appreciative management saw fit to provide free lunches at the plant cafeteria. Every day just prior to noon, lunch tickets typed out by a secretary on white cards were distributed. One day the supply of white cards ran out. The secretary turned to blue cards of the same size. There was no other change. At once there was an uproar, "We are all getting blue tickets. We are being fired. Let's get out of here."

Temporarily at least a well-going project "flopped." Change is a certainty in all environments. Not all change is beneficent. Amelioration of this harmful impact is just one part of the safeguarding of the environment. Perhaps the real objective in introducing this comment on change is to observe that this is a far cry from the purification of sewage, but who will deny its import?

## The Measurements and the Standards Of the Environment

A devil that you know is far less frightening than an unknown devil. No speaker before this Congress used those words, but many attested to the devils in the environment and the necessity for bringing them into the light. In casual fashion, the addresses made may be grouped into two categories as to emphasis. One lot of speakers fell into the "my experience has been" type while others were of the "future needs are" form. Yet few speakers failed to emphasize the incompleteness of the measurement of the environment. Always there was the call for more exploration, more research, more funds, more personnel, and more certainty.

The shortcomings in exploration well may be exemplified by the status of industrial toxicology. About every 24 minutes some brilliant chemist turns out a new chemical. That means 60 in the 24 hours or near 22,000 in the year. By no means will all these new chemicals reach the production line and of those that do the majority will prove to be harmless. Yet, all of those chemicals potentially may provide hazards to industrial workers. The entire present day force of industrial toxicologists cannot keep abreast of the day by day outpouring of new chemicals, to say nothing of the back-woodpile of a casually estimated 60,000 industrial substances long ignored since overtly they have killed no workers nor brought about an obvious impairment. The situation is staggering.

It may be recognized that we have made a fetish of exact standards under many circumstances when exactness is not in order. The clamoring is for a precise figure of so many bacteria per centimeter of fluid, of so many dust particles per cubic foot of air or so many milligrams per cubic meter of air. These standards of tolerance often referred to as MAC's (Maximum Acceptable Concentrations) should never be regarded as levels of exactness. The physician has standards, such as with reference to the expectable number of red blood cells or white blood cells in a specified unit of blood. But the physician is little concerned if for the red blood cell count there may be a million more or a million less than the standard, and in the case of white blood cells, if the returns are a thousand higher or lower than normal.

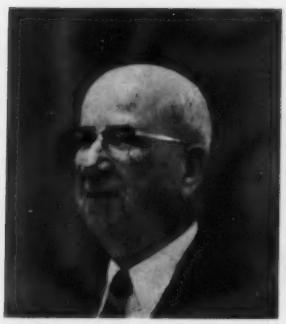
The damage that comes from set standards seldom arises among those skilled in making determinations, but from those less informed, such as the attorney when litigation arises. Particularly it is undesirable that fixed standards as they relate to human beings should be introduced into legislation. Once a figure finds a place in an enactment it is there to stay for a long

time and may become an endless trouble maker. In scores of texts appearing over two generations, firmly it was stated that the maximum acceptable concentration for prolonged exposure to nitrogen dioxide was 39 parts per million — no more, no less. This goes back to a publication of Karl Lehmann and Hasegawa, *Arch. f. Hygiene* 77:323, 1913. If one were to consult that ancient publication it might be found that this standard was set after somewhat casual work such as with a half dozen cats, employing analytical methods far from accurate. The present MAC for nitrogen dioxide is five parts per million, but that old figure of 39 lingers on to the benefit of none. There do come times when exactness is requisite. When the chemist deals with molar solutions only the scantiest of tolerance may be accepted. In the manufacture of screws the pitch must conform to an exact standard else there would be no interchangeability. Exactness in pH levels must be observed in many chemical determinations. But the human being is no screw with threads and his tolerance provides wide variation. There is every reason for measuring and appraising the harmful constituents of the environment, but all too many difficulties arise when attempts are made to reduce these measurements to a rigid standard without any deviation. Higgins Lake in the State of Michigan is sometimes described as "the fourth most beautiful lake in the world." By no possible measurements may any such exactness be justified. In like manner many biologic situations defy rigidity in standards.

## Highlights and Springboards

In good time the entire Proceedings of the Second National Congress on Environmental Health will appear in booklet form. Until that time it may suffice here to introduce brief excerpts from the numerous presentations such as will provide the flavor of every author's contribution.

DR. HENRY VAUGHAN in his keynote presentation of objectives and goals of the Congress had available this little known quotation from Abraham Lincoln: "The legitimate object of government is to do for a community of people whatever they need to have done but cannot do at all or cannot do as well for themselves in their separate and individual capacities. In all that the people can do as well for themselves, the government ought not to interfere."



Henry F. Vaughan, Dr.P.H.

DR. RENE DUBOS: In the past, man has depended on his adaptive potentialities to function under all sorts of conditions and to colonize the whole world. Now, man increasingly changes his environment, instead of depending upon his genetic and physiological adaptability. As disease is the result of failure of adaptation (of the body or of the mind) to environmental forces, the control of disease can come in large part from the control of environment. In fact, at the present time it is commonly assumed that man no longer needs to make the effort to adapt, and that he can control disease by controlling his environment.

Rene Dubos, Ph.D.

In reality, however, man can control only a limited number of factors of his environment (through better housing, clothing, nutrition, and sanitation; decreased exposure and better managed physical exertion, etc.). These controllable factors are those that are included in the "standard of living." It is certain that their control accounts for most of the improvement in health during the past century.

However, there are other factors that cannot be controlled so readily, and perhaps not at all; namely: (1) those that are built into the hereditary fabric of man, his biological cycles and perhaps his fundamental emotional responses, and (2) certain unpredictable natural forces and, more important perhaps, the unpredictable effects of technological civilization.

DR. THOMAS FRANCIS, JR.: So, too, the physical environment of air, water, soil, construction, transportation, and extraterrestrial agencies exerts a continuing but fluctuating influence upon the makeup and behavior of the biological environment. Whether we call it an epidemiologic or ecologic community

Thomas Francis, M.D.

— or an ecosystem — it is this interrelated complex which governs the life of man and his biological associates. Disease and disorder may be viewed, therefore, as a lack of adequate adjustment of man to factors in the environment. They represent the risks encountered by man in nature — consequently, natural phenomena rather than the result of agencies specifically designed for harmful purposes. They have, nevertheless, provided a powerful system of checks and balances.

The social tendency toward crowding is one of the most disruptive of a balanced ecology. Nature is said to use famine and disease as regulatory mechanisms. Theobald Smith has said succinctly "Nature abhors a crowd." Crowding, therefore, constitutes an increasing hazard under urban conditions for those diseases which man transfers to man. The respiratory infections represent an unrelieved burden. The viral smog is a component of air pollution as well as the physicochemical elements. These facts are well observed in institutions and military units. Here again, the increased crowding together in the colder season is undoubtedly a significant factor in creating the respiratory season. The 1957 epidemic of influenza illustrated the influence of crowding so clearly. Its presence first became well recognized among crowded refugees in Hong Kong; it occurred in naval vessels; it appeared in India, for example, particularly in large factory groups; in the United States it was primarily noticed in youth gatherings. It became especially pronounced in school age groups when school convened. It was not highly virulent but required aggregations for sufficient transfer. Still other factors are the influence of climate upon the physiological behavior which in winter enhances receptivity of the host to these infections, just as warm weather creates the enteric season by increasing chances of contamination, organismal growth, or host receptivity.

DR. ROBERT KEHOE: Chemical hazards of water, air, soil, and food encountered in the place of work (industry, agriculture) and in the community; insults on man over short and long periods of time, their significance, means of measuring and evaluating; changes in industrial methods affecting the efficiency, as well as morbidity and mortality, mental attitudes, leisure and recreation; chemical additives used by industry, including foods; insecticides and fertilizers; wastes expended through water and air; fuels, solvents, detergents, adhesives, etc.; possible influences through food, water, air, clothing, animal and fish life, recreation facilities (swimming, boating) etc.; physiologic response; toxicity to man and animal; synergistic and antagonistic effects; need of keeping informed of raw chemicals introduced by industry and study of potential effects on man and his environment.

Robert A. Kehoe, M.D.

DR. ABEL WOLMAN: While we live in an age of hasty improvisation and equally rapid decision, we view with alarm change and its assumed consequences. This general feeling of crisis has penetrated into our discussions and assessments of our changing environment. The orthodox underpinnings of public health practice, namely, safe water and milk and their wide distribution, tend to be understressed in the rush to greener, but less understood, fields of endeavor. This is not because the general necessities have been met in our country, but because their actual contribution to disease has been almost completely eliminated by conscious design and management. Success has brought the penalty of official disinterest, even while the overflowing septic tank invades the country by the millions.

Abel Wolman, Dr. Engr.

The motor vehicle accident death rate is a national disgrace, the responsibility for which must be shared by the public, highway designers, manufacturers, enforcement officers, and health workers. The last of these groups still views these undertaker certificates of death, great as they are in numbers, as problems somehow beyond professional concern.

That the causes of automobile accidents are baffling and their controls are difficult, may well be matched by the ignorance of some of the causes of the cardiovascular diseases. The comment is even more appropriate in the undetermined diseases resulting from atmospheric pollution or from the widespread uses of exotic chemicals in food, water, land, and air. Yet investigation, discussion, and even regulation proceed rapidly and with great public support in all these latter areas.

DR. JOSEPH J. SPENGLER: I divide environment in two parts, that existing outside men considered as a group inhabiting a region or a country or the world; and that which, while describable as non-physical and super-organic in character, exists outside individual man, or outside any small component of the larger group to which I have referred, but within mankind or (preferably) some segment of it. Environment in the first sense is essentially physical in character, while that in the second sense is essentially subjective and social in character.

Joseph J. Spengler, Ph.D.

Most of my discussion will relate to the impact of social and economic factors upon man's physical environment or habitat. However, as the subject of this conference implies, physical environment is not necessarily a constant, but is instead a slowly changing variable subject to still further deliberate or accidental modification at the hands of man. One may think of man as being pitted against nature, though with a much better chance now of taking at least some of the innings than was the case even two or three centuries ago. For, while man may be barred from modifying the stock of mass-energy, he can put energy to increasingly effective use and he can impose ever more varied forms upon matter. Man's physical environment, therefore, consists of artifacts of his own making and of pieces of nature that have been made subservient to his wants, as well as that vast portion of nature which remains in a virtually pristine state and is as often opposed as congenial to his comfort. If we define the physical environment of any time and place, therefore, we must define it as a function both of man's past efforts and of nature and her forces.

The other part of the environment of man, or, more accurately, of the individual man, is the subjective world by which he is surrounded. It is the content of the minds of those composing the community by whose behavior his own material condition is largely determined. It consists primarily in the values by which the members of this community live and order their affairs and the world of concepts by means of which they cope with environment, analyze problems, fashion institutional solutions and arrangements, and overreach the actual world in order to comprehend it better. For want of a superior term, we may call this man's subjective cultural environment.

HON. JOHN E. FOGARTY: I also see eye to eye with you, I believe, on the role of the Federal government in the control of the harmful environment. That role is and should be a limited one. States and communities have the primary responsibility for keeping their environs healthful. The Federal government should do only those things which cannot be done or cannot be done adequately without Federal support. Research — on the scale required — must be Federally aided. Enforcement action to prevent pollution calls for Federal participation when jurisdictional boundaries preclude effective state or local action. Financial aid for developing statewide or regional plans, for river basin studies, and for other programming, that would probably never be done without the incentive of such aid, is also a justifiable field for Federal action. Demonstrations and other technical assistance is a legitimate field for Federal support, since the lessons learned can be applied to many communities.

Hon. John E. Fogarty, Dr. Pol. Sci.

MR. WALKER L. CISLER: The problems of air pollution created by the storage, handling and burning of fuels are of great magnitude. Many factors are well under control and others are yet to be solved in a fully acceptable manner.

Much progress has been made in controlling the dust coming from the handling and storage of coal. Cleaning is part of the preparation at the minehead, and improvements have been made in coal storage at the plant site. Formerly, it was believed that to avoid spontaneous fires under the surface, a coal pile could not be more than 40 feet in thickness in any direction. (Incidentally, this was a homely but interesting example of critical mass.) Now we use compacting methods that reduce the air spaces in the pile, making it possible for us safely to increase

Walker L. Cisler, Dr. Engr.

the over-all size. Because surface area increases more slowly than volume, there is now relatively less surface from which dust can blow on a windy day.

The inevitable product of combustion is gas — commonly called smoke — which may carry varying amounts of ash or unburned carbon. A part of the gas may be toxic, and some constituents frequently are corrosive. All thermal power plants discharge substantial amounts of gases formed by combustion to the atmosphere, and all such discharges are potential air pollutants.

In dealing with this situation, there are important points which we must keep clearly in mind. If we are to have industry in which combustion is an essential process, and there are many such industries, the gases formed in the combustion process must be discharged to the atmosphere. There is no other method for their disposal. We need not argue the point that such industries are necessary and that inevitably they must be located close to the major population centers. Our solution to the problems of environmental health must lie in control of the combustion processes, treatment of the gas effluents and their discharge into the atmosphere, in a manner which will minimize objectionable conditions.

MR. DWIGHT L. STOCKER: We must have clean air around our plants, for we are in food packaging. We ask for clean air from our neighbors, and our neighbors ask the same from us. They may be home makers or other industries. We must constantly watch our stacks to make sure that the plume is a light gray. Sometimes we fail, and we are quickly reminded of our obligation. Each new furnace or boiler we install has an improved dust collector, and we have put in four in as many years. We try to burn our smoke; we handle our cinder carefully; we try to make sure that coal dust is collected.

Dwight L. Stocker, B.S.

MR. ALEXANDER M. TURNER, and MR. H. A. BARNBY:

In the year 1959, industry data show there were over 115 billion paper boxes produced and consumed in the United States for an average upwards of 2,500 per family; there were 45 billion metal cans used, or 990 per family. We also consumed 35 billion grocery bags and sacks, 22.5 billion glass containers, 24.8 billion cigarette packs, 9.2 billion beer cans, 2.1 billion pet food cans, 1.4 billion liquor bottles and 3 billion medicinal bottles.

H. A. Barnby, M.S.

It might be easier to comprehend the magnitude of these quantities if we use another means of illustration. The cellophane used in 1959 made into a strip a yard wide would reach from here to the moon 15 times. The aluminum foil used in the same year formed into a strip a yard wide would span the distance from Washington to Moscow 400 times. Glass containers produced in 1960 placed side by side would stretch around the world at the equator 25 times. (At least that gets us back to earth again.)

This revolution has resulted in an endless array of benefits to meet increasing public demand for convenience, labor savings, speed, improved quality, and the like. It is estimated that over 2,200 different items are packed in metal cans. With respect to cellophane, it is interesting to note that there are 105 different types of this material tailor-made for specific end uses reportedly encompassing over 100,000 different kinds and types of cellophane. Similarly, many thousands of different products go into glass containers, folding cartons, plastic containers, etc. If, as is reported, our population is to be doubled in the next 38.5 years, there certainly will be no letup in the demands for more in the way of innovations and improvements.

DR. CHARLES GLEN KING: In all food raw materials, however, whether grown in primitive forests or on modern farms, there are always some materials present, such as arsenic, copper, or oxalic acid, that would involve obvious risks to health if consumed in excess quantities. Hence the food industry has a dual and rapidly increasing responsibility to safeguard the balance content of all the nutrients as furnished in the general food supply, plus a similar regard for the environmental factors that might affect health or the esthetic

Charles Glen King, Ph.D.

values of food, such as harmful bacteria, spray residues, radioactive matter, or grains of sand in the asparagus.

Identifying and getting some appraisal of the functional role of the individual nutrients have permitted our own generation, in many parts of the world, to achieve for the first time in human history a reasonable degree of year-round control over abundant, safe, and nutritionally adequate food supplies for large masses of population. Although these developments now permit providing generously for all age groups and all economic segments of the population, we cannot be complacent with this fortunate state of affairs, for many reasons. Many gaps still exist in our basic knowledge about the best use of foods to conserve health. This is particularly true of the use of food to defer or prevent many of the diseases that are associated with the upper age brackets. The biggest gains that we have made in conserving health by applications of food science have been:

1. In protecting food and water supplies from contamination with disease-producing microorganisms,
2. In developing a variety of low cost foods such as milk, meat, grains, fruits, and vegetables that permit good nutrition of infants and children, and
3. In making a safe, year-round food supply available to practically every city, village, and rural segment of the population, as a result of the food industry's moving ahead rapidly in its role of food processing and distribution.

DR. STANLEY A. CAIN: Conservationists are busy doing a lot of different things, and these things appeal to so many people who don't do them themselves, and the activities appear in such a favorable light today, that conservation in the public image is usually something that is "good." This acceptance of the virtue of conservationists and the social desirability of conservation has become so much a part of our national image that it is often not politically expedient to be against anything that has been labeled conservation. This is true not only for politicians and public agency people; it is also true, to a degree at least, for private enterprise. I think, then, that most of us probably believe that we are conservationists in spirit, and that conservation should be practiced by those who manage our natural resources.

Stanley A. Cain, Ph.D.

The universal conservationist is probably a mythical person, perhaps a creation of the academic mind and its tendency to generalize. It seems likely that everything cannot be conserved everywhere at the same time and that the ideal of "wise use" gets impaled on the horns of the dilemma that grows on the beast of ignorance. Worse than that, even with plenty of knowledge, dilemmas remain because of inherent conflicting forces in nature and the conflicting goals of society and individuals. A resource can be used in different ways to satisfy different human needs, and these uses are not all compatible, even though each alone could be used according to conservation practices and goals.

The rate at which the United States is becoming increasingly a "have not" nation with regard to war materials for domestic consumption seems not to worry very many people. Some materials, such as natural rubber, we do not produce at all because we do not have in our country a suitable climate; while others, such as tin, for geological reasons do not occur here as economically useable ores. Other materials, such as petroleum, are produced by us, often at the fastest rate in the Free World, yet our production is unequal to our needs, and we are a net importer of them. In many cases, our domestic production could be stepped up so as to meet the demand; but this is either not economically feasible at the present time, or it would deplete known domestic resources in a dangerously short time.

Some very optimistic people feel quite sure that Yankee "know-how" will find a way, that substitutes will be found for materials which may become in too short domestic supply and which, perhaps with the turn of the international political wheel, may become unavailable to us from overseas. Prudence would suggest caution and planning. To gamble our future or our children's future with the wastefulness of an affluent society may be shortsighted. Perhaps our confidence for the future is warranted by our history of success in wringing great wealth from nature, and I would not sell short the future possibilities of science and technology; yet concern for the future needs to be extended to American society. Concern for the future does characterize the largest firms in the forest industries, perhaps because the interval between crops is measured from a few decades to a century; and it does occur in certain Federal agencies charged with management of the nation's resources for the general welfare over the longest possible time.

DR. H. AYERS BRINSER: As it is usually stated, the issue in recreation policy is, how much can we afford? Predictably, the question has been a rhetorical opening gambit to a justification for more. Perhaps the most significant fact that has emerged from this exercise is not the wide range of policy prescriptions, but rather the increasing frequency with which the question has been raised. It would, however, be a mistake to measure the growing importance of recreation by the number of times it comes up as a topic of debate. The more significant point is that in the course of this questioning, recreation has been acquiring a more exalted position in the hierarchy of social values. This increasing concern with recreation is a consequence of the dawning realization that the vital issues in recreation are, at the root, questions of what are desirable conditions of living rather than of simple quantity dosages. In other words, we are coming face to face with the much more difficult question, what is recreation and why is it important? This has become the necessary starting point for an investigation into the problem of how much can we afford. Thus, in spite of substantial efforts to avoid the sticky issue of value judgments, we are forced to recognize that the range and criteria of choice are the points upon which recreation policy decisions must turn.

H. Ayers Brinser, Ph.D.

Since the values inherent in recreation are the consequence of the interaction of an emerging cultural development, recreation cannot be defined by the values of any particular elite group. Even though the product of recreation is usually intangible, it is none the less a form of real production and cannot be dismissed as a mere residual to be supplied after the need for other goods and services has been met. It is as much or more an integral part of the level of living as is the second car or cellophane wrapping, and certainly recreation is something more than mere gilt on the affluent society. It is, in fact, a category of productive resource use that includes public and private recreation investment, green belts for urban centers, what the British call the amenities of life, city parks, national forests and parks, and free choice in the use of leisure time.

The point that should be made here is that the existence of these values must be accepted, and the process by which they express themselves understood before it is possible to establish any basis for measuring how much can be spent for recreation.

DR. EDWARD A. ACKERMAN, and DR. MARION CLAWSON: We are interested in farm lands and farm enterprise as an adequate, stable, healthful source of food for the people of the nation in the future. The larger the nation, the more important this responsibility becomes.

Edward A. Ackerman, Ph.D.

It will be no mean feat to provide food for the needs of approximately 60 million additional people within 20 years, as projections suggest we shall have to. Under our present technology and cultural prejudices, farm products are overwhelmingly the consumers' choice for their nourishment. While farm products are supplemented in a minor way by marine products and by synthetic food supplements at present, we cannot seriously expect either of these food sources to be important as long as farm products are abundant. By farm products we mean those which are derived both from cropped lands and from grazing lands.

The nation should also be interested in farm lands and farming enterprise as a source of employment for part of its labor force, and for families dependent upon it. Even though agriculture has occupied a declining percentage of the nation's labor force for more than a hundred years, it still must be considered an important source of employment. Indeed, probably a million workers more than are actually needed for the same volume of production are on our farms today.

It is easy enough to say that these million should be absorbed in the manufacturing industries and the service industries, as preceding surplus labor from farms was absorbed in the past. There are disturbing indications in our high unemployment levels, however, that we must re-examine farm, factory, and service occupations in their capacities to absorb workers. To a certain extent we have done this through our national land reclamation program, but in cold figures its capacity for providing jobs and family support has been pitifully small in comparison with the scope of the problem.

MR. ROBERT M. HOWES, and MR. A. J. GRAY: The old concept of rural and urban areas as separate entities still persists in much of our thinking. Yet in our urban-industrial economy, both rural and urban areas have a common stake. It is for this reason that an understanding of the unity of urban and rural areas is essential in our approach to all resource problems, whether they relate to forests, water, land, transportation, cities, or people and their institutions.

Robert Howes, B.L.A.

In an urban-industrial society, resources are no longer forests or water or minerals; they are no longer cities or people or their institutions. They are all these and more. Resources in an urban-industrial society are a part of a process involving the substance and products of the earth, the people who use them, and the means by which they are used.

In an urban-industrial society, increasing demands upon resources and the competition for their use require that decisions on resource allocation increasingly consider the long-range needs of society as a whole. The fragmentation by area and subject matter jurisdictions, which may have been satisfactory in an agrarian society, is no longer adequate. The problems of our depressed mining and farming areas cannot be considered separate and apart from the problems of our metropolitan areas. Water resources cannot be separated from transportation and urban resources. Flood control is no more a part of area development than is water supply or recreation.

If these and other separate programs are to be fitted into sound and effective developmental programs equal to the needs of the times, we must understand the role and function of planning within our society. Planning is not an overriding device for authoritative action, but a necessary ingredient of the decision-making process. Planning can no longer be considered as a reform movement; it is one of the essential tools of resource management.

Ways must be found "to foster in public management the recognition of its responsibility for planning." This will require a re-evaluation of "the theory and philosophy by which we operate, to see the nature of governmental planning as something broader than our immediate technical concerns."

DR. HERMAN E. HILLEBOE: Sanitary engineering is a quantitative field and the scientific method applies to it more than to any other practical activity in public health. Accordingly, environmental health experts of the sixties have an unequalled opportunity to use modern business methods in their lifesaving and disease preventing work. The mass of data handled by a department of any size is made to order for electronic record keeping, computing, and activities control. Experiments, demonstrations, exploration, and exploitation of new techniques — these should be the order of the day in environmental health. The use of automation in laboratory procedures involving great numbers of samples of water and milk could increase efficiency and save professional personnel.

Herman E. Hilleboe, M.D.

To carry out research in public health practice in environmental health a combined attack might more quickly accomplish the task. The engineering schools, the schools of public health, and the larger health departments each have a unique part to play. In the past, these groups have tended to go their independent ways, perhaps because of natural preoccupation, perhaps because of their differing responsibilities. The time has come for these groups to join forces, with the aid of our ablest experts in public administration, and to bring to environmental health activities the latest methods of big business. The techniques that bring profit to industry can increase community profits in environmental health.

DR. JOHN PORTERFIELD: We are all concerned, and rightly, about the total body burden of chemicals reaching us through food, water, and air, at home, in transit, and at work, throughout the years of our lives. Yet we have not matched our administrative machinery to our concern. The Department of Agriculture certifies that a certain

John Porterfield, M.D.

chemical kills bugs. That is its job, and there, officially, it stops. The Congress has directed the Food and Drug Administration to operate on the basis of a zero level of tolerance for any carcinogenic substance in foodstuffs. The celebrated Battle of the Cranberry Bogs a couple of years ago was fought on this line. Yet the FDA, through no fault of its own, has a large backlog of untested materials. Meanwhile it is not unlikely, at least in the case of some potential carcinogens, that people ingest greater quantities by drinking water from surface streams near the place where the chemical is used, or by breathing the air near the plant where it is produced, than they would ever acquire by eating normal amounts of the contaminated food product itself.

HON. GEORGE P. LARRICK: When a food producer goes into business, he assumes an obligation to produce wholesome food. Today, when each of us depends on others for food, this obligation is even more important than it was a few generations ago. It would exist in the absence of the law. In our society it is supported by legal sanctions contained in the Federal Food, Drug, and Cosmetic Act.

Hon. George Larrick, D.Sc.

We in Government have an obligation to see that consumers get the pure food the law says they should have. To help industry do its part we have a strong educational program designed to acquaint manufacturers with the requirements of the law. Where the educational effort proves inadequate, of course, we apply the formal sanctions of the law.

Additionally, we have research and investigational programs in areas that are often inadequately or seldom covered by the industry. Technical administrative decisions can only be made from a sound scientific foundation. Our research programs provide the scientific background necessary to understand the pharmacological, chemical, bacteriological, and other scientific problems attendant on modern food and drug production.

DR. ALBERT C. JACOBS: Let us recall the basic framework of our society. According to that hallowed document, the Declaration of Independence, ". . . are endowed by their Creator with certain unalienable rights . . . among these are life, liberty and the pursuit of happiness . . . to secure these rights, governments are instituted among men, deriving their just powers from the consent of the governed." Every schoolboy is familiar with these dynamic words. Authority is vested in the people, and government derives its "just powers from the consent of the governed." The Declaration of Independence and our subsequent philosophy exalt the individual rather than the state, regard him as the master, as of supreme importance, and government as the agent of the citizen. As a consequence, government exists for the benefit of the individual and not vice versa. Under a totalitarian society, on the other hand, government is supreme; the individual is a mere cog in a material machine.

Albert C. Jacobs, LL.D.

MR. F. K. DOSCHER: I have drawn upon my own industry for examples as to how government, industry, and health officials can cooperate for better environmental health. I have done this, not because my industry is the only one which has been a leader in this all-important cause, but because I have been intimately associated with it for more than 25 years and am personally acquainted with its long, continuing fight to approach the ideal. Certainly, this does not mean that I fail to appreciate — and applaud — the many outstanding programs other industries have promoted in the interest of environmental health. One has but to look around this great land of ours to see that much has been accomplished.

Mr. F. K. Doscher

While many other countries still suffer from beri beri, scurvy, and other such nutritional diseases, these dreaded ailments are virtually, if not totally, unknown in our country. Diseases common in the United States a brief 20 years ago are now eliminated, or their effects sharply reduced. You all know the story of Salk (who worked in this building for five years) and his life-saving vaccine. Tuberculosis and pneumonia

no longer hold the dread they once did, because they can be brought under control or, in many cases, cured. Children now are immunized against many of the childhood diseases which once were the cause of grave advances; life expectancy tables in the United States are now at an all-time high. Life insurance tables now list man's life expectancy at 69.3 years; just 25 years ago, this was computed at 58.5.

DR. LEONA BAUMGARTNER: The problem of cleanliness in restaurants has been a complicated one. The equipment used is important, and it has to be easily cleanable. But the heart of the matter is cleanliness, the habits of the food handlers. Proper hand-washing is a must. Absence of it often leads to food poisonings.

Leona Baumgartner, M.D.

Naked law enforcement will not solve this problem. The employees will wash their hands when some one watches, but until they are convinced that it makes sense, that it is vital to wash their hand, the problem is not solved.

The people who wash dishes or work in restaurants come out of the high schools. We went to the Board of Education and asked them to set up a special school of food sanitation. They did. We trained youngsters there and gave them certificates when they graduated. And we said to the restaurant people: Hire them, they're good. And they did. And to these youngsters we said: You've got a certificate that will make it easier for you to get a job. And they found that this was so.

I might say parenthetically that we have 22,000 restaurants in New York City and more than 5,000 change hands in an average year. From this evidence, I think there are two reasonable conclusions — either these owners make enough in one year to retire, and this is not too likely, or it is a chancy business.

Little by little the restaurant people realized that trained employees were better than untrained, and that running a clean restaurant was good business.

### The Missing Priceless Element

Gigantic as were the achievements of this Congress, and for nothing is there belittlement, something essential scarcely appeared. This missing element was imagination. This Congress was bowed down by techniques, procedures, methodology, laws, regulations, politics, appropriations, competitions, research grants, and the past. All these things are the realities but they are but tools to a higher vitality. In *Love's Labor Lost* may be found these words: "This is a gift that I have, a foolish extravagant spirit, full of forms, figures, shapes, objects, ideas, apprehensions, motions, revolutions; these are begot in the ventricle of memory, nourished in the womb of pia mater, and delivered upon the mellowing of occasion."

Shakespeare may not have known it but he was describing the environment. The environment in itself is a gift and the pursuit of its control is an invitation into a fantastic world of expanding scientific opportunity. In one age old story a gazer upon a cathedral under construction asked one stone mason what he was doing. The reply was, "I am cutting stones." A nearby second mason was asked the same question. Came the reply, "I am building a cathedral." This Congress and all of public health are faithful hewers of stone and drawers of mortar. The environmental cathedral, well under way, is far from completion. Imagination has not had its day.

The mother in an environment harboring a dying infant, a wayward son, a prematurely aging husband, and a house falling into shambles, thinks not in terms of a perfect Inhoff tank or dust counts proudly reduced to a standard tolerance. She thinks of happiness never quite attained, of satisfactions never gained, of frustrations never banished, of poverty never surmounted, of needs never fulfilled. When public health in all its ramifications extends its imagination to the creation of a new dimension that reaches into the heart of mankind, then may come the hope that this cathedral may attain completion.

### The Final Appraisal

Every participant of this Congress formed his own estimate of the worth of this Congress. Here as a finality is the estimate of Dr. Robert Anderson:

> That man is both the creature and creator of his environment threaded through the discussions of the Second National Congress on Environmental Health. The history of civilization is replete with evidence that life, health — and death — have been influenced by physical, chemical, and biological forces, as well as bacteriological agents in the air, water, and land which man needs for his vital processes and which he uses in his daily activities. Population growth and technological development have increased the breadth and

changed the character of the interphase contact in this ecological relationship. Moreover, there are evidences of impact of these two forces on botanical and zoological aspects of our world. Observation and study now and in the future will continue to elucidate the cause and effect relationship of these phenomena as they have in the past. And as man in his society understands these relationships, he will make choices and take steps to modify these impacts in such a way that he profits from the benefits of technology and population growth without paying a dear price in health and life to attain them.

The Congress was impressed with the breadth and scope of current activity by our industrial, governmental and university institutions in research and in application or control in this field. While these activities demonstrate both present actual and future potential accomplishment, more importantly the Congress feels they reveal inadequacies which demand immediate attention, if man, and the creature of his environment, is to be a wise creator of it.

The Congress calls upon our nation's industries, our universities and our governments for stepped-up programs of research and application and the training of people to do them. Because it recognized first the similarities of the chemical, physical, physiological, toxicological, and control problems in each of the environmental media and second, the possible additive and cumulative nature of inimical substances, the Congress recommends that the efforts be organized, conducted, and reported in such a way that environmental health, broadly, is realized.

The Congress recognizes the benefits of cooperation and collaboration between industries, educational, and governmental institutions and urges that such endeavors be elaborated. Yet it recognizes the appropriate interests, responsibilities, and obligations that each has and encourages each to develop its appropriate role.

For industries, the appropriate role seems to be especially the identification and study of the problems peculiar to the particular industrial situation and the development and application of effective, pertinent control measures to protect the worker and his community environment and the consumer. For educational institutions it is the preparation of technicians and scientists for their work and the conduct of research both basic and applied.

For government, local, state, and national, it is the encouragement, support, and assistance to industry and university efforts, the surveillance of the problems and the programs, and, when necessary, intervention in the public interest. The Congress feels that the official health agencies are especially suited, by reason of their legal responsibilities, their programs and their experienced staffs, to be the organizational focus within governments for these activities. It urges health agencies — local, state, and national — to develop effective programs for environmental health enlisting the participation of private and public groups who have competence, interest, and sometimes responsibility for particular aspects of the environment. It believes that if the U. S. Public Health Service will develop on the national level a program in this field using features that are so successful in approaching individual health problems, such a program will be a great stimulus to other governmental agencies, universities, and industries who have like objectives.

• RENE DUBOS, PH.D.
Professor, Rockefeller Institute
New York City

# MAN versus ENVIRONMENT

Prehistorical documents, as well as historical records, make it clear that all important types of diseases (physical and mental) have been coexistent with man. Hence there exists a universal aspect to medical sciences. This aspect is concerned with the detailed study of the body and of the mind, as well as of their derangements. This is valid everywhere and always, and is a part of general biological science. Clinical medicine utilizes this knowledge for manipulating and controlling the body and the mind, in health and disease.

## The Universality Versus the History of Disease

While diseases may not change qualitatively, they certainly have changed quantitatively. Indeed, the patterns of diseases endlessly change from one place to another and from one time to another. It can be said that each civilization has a pattern of disease peculiar to it. The pattern of disease is an expression of the response of man to his total environment (physical, biological, and social); this response is, therefore, determined by anything that affects man himself or his environment.

Although man has not changed fundamentally since Paleolithic times (his nature is determined by 20,000 pairs of genes), there exists nevertheless the possibility of important genetic shifts resulting from balanced genetic polymorphism. Hence we can assume that changes in the patterns of disease can be accounted for in part by genetic mechanisms. Unfortunately, too little is known of this aspect of human nature at the present time to permit either a detailed analysis of its effects or the possibility of its control.

In addition to his genetic flexibility, man has an enormous range of phenotypic adaptive potentialities. These go all the way from purely physiological adaptations (for example, to hot weather or to high altitude) to the various types of humoral and cellular immunities. There is no doubt that phenotypic changes play a large part in the changes that have occurred in the prevalence and the severity of individual diseases.

In the past, man has depended on his adaptive potentialities to function under all sorts of conditions and to colonize the whole world. Now, man increasingly changes his environment, instead of depending upon his genetic and physiological adaptability. As disease is the result of failure of adaptation (of the body or of the mind) to environmental forces, the control of disease can come in large part from the control of environment. In fact, at the present time it is commonly assumed that man no longer needs to make the effort to adapt, and that he can control disease by controlling his environment.

In reality, however, man can control only a limited number of factors of his environment (through better housing, clothing, nutrition, and sanitation; decreased exposure and better managed physical exertion, etc.). These controllable factors are those included in the "standard of living." It is certain that their control accounts for most of the improvement in health during the past century.

However, there are other factors that cannot be controlled so readily, or perhaps not at all; namely: (1) those that are built in the hereditary fabric of man — his biological cycles and perhaps his fundamental emotional responses, and (2) certain unpredictable natural forces and, more important perhaps, the unpredictable effects of technological civilization.

I shall illustrate by a few examples the action

of some of the forces which are as yet poorly understood, and which bid fair to add more and more to the difficulty of environmental control as our society becomes increasingly urbanized and industrialized.

### Man and his Environment

All living things exhibit cyclical variations of their various activities. Thus, it has been shown that secretion of certain hormones, or the metabolism of fats and sugar, vary profoundly from one season to the other even when the conditions of temperature and the supply of food are kept constant. Similarly, there are daily cycles in hormonal activity, in electrolyte excretion, in body temperature, etc. Although these cycles have been studied chiefly in experimental animals, there are convincing observations demonstrating that they occur also in man. In fact, it seems safe to predict that an increasing number of essential biological activities will be found to be linked in some way to the natural forces operating in the universe.

It is a characteristic of biological cycles that they continue to operate even when the individual is placed under totally different conditions; in other words, they behave as if they were the expression of some property built into the cellular fabric. For example, the daily temperature cycle of the body (with a low at night and a high in the afternoon) remains evident for several days after the individual has been transferred to an environment where the hours of light are artificially reversed. Likewise, the level of urinary excretion of steroid hormones, which normally has a daily cycle with a minimum at night, continues on this cycle, but with its minimum during the day, when a person moves by airplane from America to Asia. The hormonal disturbance caused by the change of latitude lasts for several days, during which the person is out of phase with the environment. However, this condition is not permanent. After a certain period of time — of the order of one week — the person comes into phase with his new environment, the physiological functions progressively becoming linked to the local hours of light and darkness, whether these be determined by artificial illumination or by the latitude of the place.

Thus, biological cycles depend on some characteristics peculiar to the organism, but they also exhibit adaptive responses to the environment. This interplay between the innate nature of the organism and the environment in which he lives, focuses attention on an aspect of modern life which has been neglected by medical science. At an ever increasing rate, man is being separated from the environmental forces among which he has evolved; he has hardly any occasion to experience the impact of regular seasonal variations; he carries his day into the night or vice versa; he moves by jet in a few hours from one climate and one latitude or longitude to another. The fact that, by artificial light, the production of eggs by chickens can be readily increased and also prolonged throughout the year is evidence of the profound alterations in normal physiological rhythms that can be caused by manipulating the environment. There is no doubt that the technological innovations of modern life have profound effects also on human physiology, and it is not unlikely that some of these effects play a role in the diseases of civilization.

At first sight, the effect of physical factors of the environment appear simpler and better understood. For example, a large part of the influence of weather conditions on health can be explained by the fact that heat and humidity affect the survival and spread of infective agents and their vectors. However, there is good reason to believe that bioclimatology involves other biological effects which are more subtle, and probably as important. Weather fronts and winds like the Fohn of Central Europe, the Sirocco in Southern Europe, or the Chinook of the Rocky Mountain Region certainly affect behavior and health, but the mechanisms of their action are not understood and should be more extensively studied. Probably man responds to many atmospheric factors other than those usually recognized — for example, to ionized air particles.

The study of air pollutants has recently revealed the deleterious effects of a variety of substances commonly present in the atmosphere. Whereas it had long been known that the air in certain urban areas contain enough $SO_2$ and free hydrochloric or sulfuric acids to cause irritation of the mucous membranes, it is only during recent years that ozone and peroxides (as produced in the Los Angeles type of smog) and the nitrogen oxides (released from cigarettes and from automobile exhausts) have been recognized also to have irritating effects. The various carcinogenic agents that contaminate the air — from benzpyrene to ionizing radiations — can be expected to increase in variety and concentration as the world becomes more completely industrialized.

Although environmental factors can have direct pathological effects, the more common situation is that disease and incapacity arise from the *response* of the body, or the mind, to the noxious forces. In other words, disease is usually a reaction to, rather than a direct effect of, the adverse stimulus. Human beings differ in their genetic equipment, in their past experience, and

in the way they have been conditioned by environmental forces; and for this reason they differ in their response to any given set of conditions. It is well known, furthermore, that man responds not only to the stimuli themselves, but also to the symbols of stimuli. Disease patterns are determined not only by the intrinsic properties of the noxae but also by the symbolic meaning that they have for each particular individual. Thus, all the forces of the environment — physical, biological, and social — become enmeshed in an extremely complex manner to act as direct and indirect agents of disease. The science of public health cannot ignore the interrelatedness of the multiple aspects of human life. In practice, however, it must focus its attention on the etiological determinants that it can manipulate, lest effectiveness of action be sacrificed to the altar of complete understanding.

### Long Range Pathological Effects

Interference with biological cycles has one health aspect in common with bioclimatological factors. In both cases, the most important effects are insidious; their overt pathological manifestations do not become evident for many years. For example, if it proves true that air pollution can engender chronic bronchitis and neoplasms, these could not appear as overt disease until long after exposure to the initiating agent. As in the case of ionizing radiations and leukemias, cause and effect may be separated by one or several decades. The same situation probably applies to whatever may be the pathological consequences of artificial abnormalities imposed on biological rhythms.

The problem of relating cause and effect when the two are separated by such a long interval of time constitutes a very difficult challenge for scientific medicine. Indeed, it raises problems of research organization with which most experimenters in human pathology are unfamiliar because their greatest efforts in the past, and also their greatest successes, have been in the area of acute disease processes. The challenge is to adapt the experimental method developed for the study of these acute processes to the complex scientific problems posed by the recognition and analysis of long range pathological effects.

The study of the delayed disease manifestations of technological changes will demand not only new concepts, but also a new attitude on the part of experimenters and of the public bodies that support their work. In fact, long range experimentation of chronic effects will not be possible unless we learn to develop a new kind of scientific organization. For example, it will be necessary to create facilities and techniques for the maintenance of experimental animals for months and years under a wide range of conditions of husbandry; there will have to be new budgetary rules for financing research programs of many years' duration; and most difficult of all, ways will have to be found to enlist and sustain interest in certain problems among groups of scientists willing to make observations and to set up experiments the significance of which may not become apparent for several decades.

### Social Aspects of Public Health

Before the scientific era, several different kinds of mechanisms came into play to enable man to achieve some sort of adaptedness to his environment:

1. It is probable that in man, as in animals and plants, genetic balanced polymorphism gave great scope to genetic adaptation. The genetically unfit were progressively weeded out, whereas those who had the proper genetic endowment could function successfully under the prevailing conditions and thus transfer to their progeny their biological characteristics. Selective forces made for adaptedness.

2. Constant exposure to certain threats or stresses called into play the natural defense mechanisms that exist in any individual, and in general thereby increased their effectiveness. The mechanisms of physiological tolerance belong to this category, as do the specific antitoxic or anti-infectious immunities.

3. More or less unconsciously, all primitive people, and others as well, developed empirical processes of social adaptation: proper kinds of clothing, certain forms of training for resistance to stresses and privations, taboos with regard to certain foods or types of behavior, etc.

In addition to these mechanisms which involve changes in the body or in behavior, man has always tried to facilitate his adaptation by controlling his environment, by building shelters, storing food, making fire, etc. Progressively in modern times, and especially during recent decades, control of the environment has come to be the most important instrumentality of adaptation. Not only has man been liberated from the need for strenuous physical effort, from many of his ancient dangers, and even from some of his fears, but in addition, civilized life now helps him at every step to meet whatever difficulties he encounters. Anyone in the Western world can afford drugs to combat disease, to relieve pain, to achieve peace of mind, to help sleep, or to keep awake and stimulate activity.

As already mentioned, however, man's mas-

tery over his environment will never be complete. At the worst, there is the possibility of catastrophes, such as nuclear warfare, the appearance of new strains of infectious agents, and some mysterious maladies like those which cause the "crashes" in wild animal populations when they become too numerous. However, even disregarding these catastrophic possibilities, it is certain that the normal process of technological growth is creating and will increasingly create new threats which will demand new adaptive reactions on the part of man. Some of these reactions will certainly become the cause of new disease processes.

There is no reason to believe that the dangers to health arising from modern technology are greater than the dangers that arose in the past from the natural forces to which man was exposed, and which he has overcome in the course of his long social and biological experience. However, modern life has introduced into the problem of human response to the environment a new factor which has no precedent in biological and social history. In the past, most changes occurred slowly, often taking several generations before their effects reached the majority of the people. This gave to mankind much time for biological and social adaptive adjustments. Now most changes are explosive, spreading over a whole continent within a few years, and affecting everybody simultaneously. The new aspect of the problem is that the experience of the father is no longer of much use to the son.

Long range pathological effects will also compel a re-evaluation of public health criteria in the light of economic necessities. Although we can take it for granted that many technological innovations will bring in their train various threats to health, in practice it will prove well nigh impossible to evaluate all these potential dangers. One of the reasons is that such a study would require far greater numbers of scientists with many specialized skills than ever can be available. The other reason is that most of the effects of technology will be unsuspected and long remain undetected. How could it ever be possible to guess, and test, the possible long range effects of all the gases released into the environment by industries and motor vehicles; of the chemical treatment of food and of changes in eating habits; of air conditioning and elimination of physical effort; of the various forms of artificial light to which city dwellers are constantly exposed; of the neon advertisements, various background noises, and other inescapable accompaniments of urban life; of all the forms of stimulants and depressants upon which modern man has come to depend? To demand a certified verdict of safety before accepting a new technological innovation would clearly result in paralysis of the economic and technological progress. In most cases, the best that society can do, in view of the impossibility of acquiring all the relevant information, is to take calculated risks on the basis of educated guesses and of value judgments. Needless to say, decisions based on such subjective criteria will lead to endless controversies. One example will suffice to illustrate how much complexity the human factors add to the scientific uncertainties of the problem of environmental control.

It can be assumed that some of the synthetic substances used in agriculture have potential toxic properties and this probably is also true of some food additives. There is no doubt, on the other hand, that these same substances contribute much to the efficiency of food and agricultural technology, and thereby lower costs of production. In most cases, there is not enough knowledge to reach an informed decision and to strike a proper balance between considerations of safety and of technological efficiency. Hence, judgments of value must be made. Speaking as a citizen rather than as a scientist, it seems to me that the public has been unduly alarmed with regard to the use of chemicals in the food industry, and that legislation on these matters is unreasonably restrictive. Why rule out the use of substances for which the evidence of toxicity is at best extremely tenuous, while tolerating and indeed encouraging certain industrial practices that are certainly far more dangerous? For example, the Food and Drug Act rules that any substance that might be suspected (even without proof) of playing a role in the causation of cancer cannot be used in food technology. Yet it is legal to encourage the American public to smoke cigarettes or drive automobiles for pleasure, even though the majority of scientists believe that these two activities constitute large threats to health, far exceeding in importance those associated so unconvincingly with food additives. I wonder whether anyone has had the courage to engage in the macabre arithmetic that would make it possible to compare the potential dangers to health of various aspects of our technological civilization. Is it not likely, for example, that the cancers that might be caused by food additives would be far less numerous than those attributable to air pollution — from factories, automobile exhausts, or cigarettes; let alone the deaths and injuries caused by traffic accidents?

I have mentioned these examples, not with the intention of examining them in detail, but rather to emphasize the fact that the science of public health cannot be dissociated from social science or from considerations of human behav-

ior. Although there has been no systematic study of this aspect of public health, I shall make bold to restate here a few personal views which bear on topics that deserve more objective evaluation.

While I believe that a large part of the improvement in health during the past century can be traced to the increase in the standard of living, I see reasons to fear that the trend will not necessarily continue. It is likely, indeed, that further advances in prosperity will create a new pattern of disease. On the one hand, the fact that technological innovations involve unpredictable threats to health will create unavoidable incompatibilities between social growth and the safeguard of health. In consequence, our philosophy of existence will impose limitations on the philosophy of public health. Furthermore, the intense stimuli and the interference with biological cycles associated with life in modern urbanized society will probably generate pathological consequences which will not be prevented because difficult to recognize. It must be noted also that sanitation in the past merely demanded an action on the external environment, fairly easy to exert because imposed from without; in contrast, the pathological effects of abundance and of inactivity will be far more difficult to control because they require a much greater degree of self-discipline.

Our society will, of course, continue to strive for comfort and for protection from threats to health. However, it will have to face the fact that, because excessive concern with safety is often incompatible with economic growth, excessive regulation might result in social stagnation. A society that does not continue to grow through adventure and willingness to take chances is not likely to survive long in the modern world. With regard to health as to all other fields, society must be willing to take the educated and calculated risks inherent in technological civilization. Today as in the past, willingness to take risks is a condition of biological success.

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## Early Deaths

Despite the marked progress made in life conservation, more than one third of the deaths in the United States are among people under age 65, according to the statisticians of the Metropolitan Life Insurance Company.

About 575,000 people a year die before reaching age 65, not counting the toll in the first year of life. Accidents are the predominant cause of death among children and young adults, accounting for three fifths of the total mortality among males at ages 15 to 24 and for nearly one third of the total among females at these ages. Cancer, mainly leukemia, ranks second as a killer at ages 1 to 24.

As early as ages 25 to 44, the cardiovascular-renal diseases outrank all the other causes of death among males. Among women at these ages, however, cancer is the leading cause of death and takes nearly twice as many lives as heart disease.

There are more than 400,000 deaths a year in the 45 to 64 year age group, about three fourths of them due to the cardiovascular-renal diseases or cancer.

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# Biological Aspects of Environment

One of the risks in a conference of this type is that we will spend our time in exhorting the faithful rather than in converting the heathen. My presentation is intended, then, not as an essay or review but as a commentary and a theme.

The very term, environmental health, offers a challenge to interpretation. It can scarcely mean healthful environment when practically every component of the community is at least potentially harmful to some segment of the population. Nor can it be looked upon as intending health and prosperity to all the varied populations occupying the environment. It can no longer be accepted in the limited sense of engineering efforts to manage the physical factors of supply and disposal, since heat and cold, spring and fall, rain and drought, light and dark, height and depth, exert their peculiar influences on the biology of the community. Rather it means to control the exposures of the population to environmental stresses to a degree that is compatible with its tolerance or that can be met by ready addition to its reserve.

A direct approach to consideration of the biological environment is to view it in the context of the structural and functional composition of a community. The community of which we speak is not the governmental or social neighborhood as commonly visualized, but rather an ecological universe embracing the population and its environment. The primary concern of this conference is the human population, its health and disorders in relation to biological, physical, and social features of the environment. The biological environment comprises man himself and the other living populations, plant and animal, with which he shares the community. The character of the biological environment is governed by the nature of the available resources. In reality man lives as co-tenant with other species on the resources of the community so that in the legal term they are not joint owners but tenants in common with right of survivorship. The social environment is an extension of the basic biological setting, commonly limited to the behavior of that species most prolific with the written and spoken word. Man's competition with his own kind in wars and riots are major disturbers of the environment. Nevertheless, the social behaviors of other species of life are also profound influences upon the community. And here the roles of agriculturist, live stock breeder, the ecologist, botanist, entomologist, and conservationist enter prominently into arranging the biological environment.

So, too, the physical environment of air, water, soil, construction, transportation, and extraterrestrial agencies exerts a continuing but fluctuating influence upon the makeup and behavior of the biological environment. Whether we call it an epidemiologic or ecologic community — or an eco-system — it is this interrelated complex which governs the life of man and his biological associates. Disease and disorder may be viewed, therefore, as a lack of adequate adjustment of man to factors in the environment. They represent the risks encountered by man in nature — consequently, natural phenomena rather than the result of agencies specifically designed for harmful purposes. But the significant feature is that the social, physical, and biological components function as an integrated unit — one acting upon the other — so that it is difficult to compart-

mentalize them intelligently, although we do it constantly to the community, to man, and to his mind.

The environmental influences are especially stressed by Hippocrates (in the fifth century B. C.) in his treatise on Airs, Waters, Places:

> Whoever wishes to pursue properly the science of medicine must proceed thus. First he ought to consider what effects each season of the year can produce; for the seasons are not at all alike, but differ widely both in themselves and at their changes. The next point is the hot winds and the cold, especially those that are universal, but also those that are peculiar to each particular region. He must also consider the properties of the waters; for as these differ in taste and in weight, so the property of each is far different from that of any other. Therefore, on arrival at a town with which he is unfamiliar, a physician should examine its position with respect to the winds and to the risings of the sun. For a northern, a southern, an eastern, and a western aspect has each its own individual property. He must consider with the greatest care both these things and how the natives are off for water, whether they use marshy, soft waters, or such as are hard and come from rocky heights, or brackish and harsh. The soil, too, whether bare and dry or wooded and watered, hollow and hot, or high and cold. The mode of life also of the inhabitants that is pleasing to them, whether they are heavy drinkers, taking lunch, and inactive, or athletic, industrious, eating much and drinking little.
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> Using this evidence he must examine the the several problems that arise. For if a physician knows these things well, by preference all of them, but at any rate most, he will not, on arrival at a town with which he is unfamiliar, be ignorant of the local diseases, or of the nature of those that commonly prevail; so that he will not be at a loss in the treatment of diseases, or make blunders, as is likely to be the case if he does not have this knowledge before he considers his several problems. As time and the year passes he will be able to tell what epidemic diseases will attack the city either in summer or in winter, as well as those peculiar to the individual which are likely to occur through change in mode of life. For knowing the changes of the seasons, and the risings and settings of the stars, with the circumstances of each of these phenomena, he will know beforehand the nature of the year that is coming. Through these considerations and by learning the times beforehand, he will have full knowledge of each particular case, will succeed best in securing health, and will achieve the greatest triumphs in the practice of his art. If it be thought that all this belongs to meteorology, he will find out, on second thoughts, that the contribution of astronomy to medicine is not a very small one but a very great one indeed. For with the seasons men's diseases, like their digestive organs, suffer change.

I might well stop here except for Hippocrates' admonition that one should either know or find out.

And again, Gill in his *Genesis of Epidemics* (page 498) philosophizes:

> What is it that moulds the life of man? The weather.
>
> What makes some black and others tan? The weather.
>
> What makes the Zulu live in trees, the Congo native dress in leaves while others go in furs and freeze? The weather.

In his original definition of Oecology, Haeckel included "the so-called 'economy of nature,' the correlation between all organisms living together in one and the same locality, their adaptation to their surroundings, their modifications in the struggle for existence, especially the circumstances of parasitism, etc." Obviously, health and disease are basically encompassed in these relationships. Parasitism is a universal phenomenon involving varied levels of intimacy, complexity, and tolerance. One can speculate whether it was one of the initial mechanisms in the emergence of living material. As primitive molecular activity led to organization and function it may have been that successive stages of development carried with them the preceding stages as the foundation for higher differentiation. Or, as many have surmised, that bacteria or slime molds are among the primary organized forms, maintained in their primordial state. But somewhere early in evolution the implantation and maintenance of one form of life upon another became a general phenomenon. There are those who believe that it was not begun until distinctive development had been reached so that it was truly one organism upon another. It seems likely that effective parasitic survival requires an intimate identification of the parasite with host tissue so as to avoid expulsion; whereas, the agent which elicits sharp clinical illness is distinctly different from the host.

As man emerged from his primitive state in nature he brought with him a heavy burden of dependents, probably reflecting the microfauna

and flora of the particular area. Bacterial, protozoan, and fungal infections were probably of the earliest since they were readily maintained in man and in his environment. As the size of the social units increased and merged, the exchange of parasites readily took place. It seems likely that certain of the biological chains of transmission and reservoir actually became established in these early stages, both by adaptation of the same parasite to continued maintenance in varied hosts and by distribution of parasites from members of the natural biological population to one another. Widespread dispersions only can be conceived as man's excursions and settlements extended and enlarged, since they require aggregations of susceptibles and exchange and adaptations of the parasites.

One turns naturally to the epidemiological concepts of agent, reservoir, transmission, host, and to consideration of the factors that govern the occurrence of disease or disability in the community. And for our purposes we must return to that section of Haeckel's definition: "The knowledge of the sum of the relation of organisms to the surrounding outer world, to organic and inorganic conditions of existence; . . . ." Thus, knowledge of the influences that govern the chain of biologic relationships and exchanges is essential to the understanding of etiology, of occurrence, of control. But application of preventive measures has not been dependent upon complete understanding. Repeated observation of a set of conditions has played a major role in establishing causal relationship whether or not it was the final, essential and sufficient explanation. In fact, the recognition of transfer, whether called contagion, miasma, the witching eye or what, came very early and the early laws of hygiene and quarantine were based on recognized or strongly suspected associations. Stinking swamps and stagnant water gave rise to bad air and "the pestilence that walketh in darkness." The Mosaic laws regarding contamination and decontamination, hygiene, consanguinity, the selection of suitable animal and vegetable foods, are evidence of the recognition of harmful relationships.

Clearly, the purpose of these regulations was to break those harmful chains of association or to substitute beneficial ones. The approach to leprosy was direct; avoidance of the productive lesion and isolation of the patient. The great growth of leprosaria was evidence of its increasing distribution throughout the Mediterranean basin. And this fact of itself has been suggested by Sigerist (quoted by Zinsser p. 94) as the basis for the decline of that disease after the devastation of the Black Death, presumably by the wiping out of the leprous populations in these institutions. The ecology of leprosy has never been formulated adequately, but it still remains a prominent disorder in certain rather circumscribed areas of the world — pointing to a place infection, soil or rodents, or other localized sources of the agent.

In man's continued trend toward aggregation, to migration and modification of the environment, new exposures, new parasites and new disease-producing agents were encountered. Many of these ancient disturbances are still with us. Smallpox, measles, mumps, dysenteries, pneumonia, malaria, and certainly other protozoal infestations so abundant in the primeval environments, are so definite in early descriptions they must be prehistorical afflictions.

When animals or plants migrate they, too, can serve as extended distributors of their pathogenic agents. The invasion of Europe by rats led to the establishment among men of a new transfer mechanism in the louse. Their introduction into the New World led to the creation of new foci of constant threat in the face of social and economic disruptions. Similarly with plague: from the indistinct past it wreaked its destruction by dispersion of rats and their fleas and the rapid subsequent transfer by man and his agencies. The firmly established intimacy of rat and man is truly a struggle for survival.

Much of our present advance and hope for the future lies in improved knowledge of the chain of factors involved in a pathogenic cycle. Each disorder represents a complex epidemiologic unit which constitutes a segment of the total ecology. We have referred to the relationships which lead to causation of the particular disorder as an *epidemosis*. But in the prime position in each of these patterns is the specific agency or primary etiologic factor without which the disease does not take place no matter how many of the accessory or contributing influences may be present. This is an important feature to keep in mind when blithely speaking of multiple causation or multiple etiology.

The seasonal pattern of disease emphasizes the manner in which physical conditions bring about natural alterations of the biological environment and affect the disease-producing sequence. The heterogeneous infection chains in rickettsial infection are good illustrations. With the advent of Spring the woods come to life; the dormant ticks arouse, and attach to the renewing animal life; they obtain a blood meal, their rickettsial load is activated, they moult and they now become infectious and can transfer it to other animal species in the region. Man enters the environment and becomes an alternate source of food with the result that he develops spotted fever. Or the dog enters the vernal awakening, picks

up the ticks and brings them home to his family. In contrast classical typhus is a disease of late winter where unwashed, louse-infested, poorly fed persons huddle together for effective transmission. The endemic murine typhus is a disease of city and of rural farming areas with greatest prevalence in the summer when the rat flea is most active. While in each instance a rickettsia is the causative agent, the influence of physical environment on the biological components and on man's social activities is in many respects the determining one.

Bubonic plague of man is similarly related to the biologically active season of the year, while the pneumonic plague tends to reflect man's crowding in cold months.

Still another seasonal factor is the influence of climate upon the physiological behavior which in winter enhances receptivity of the host to the respiratory infections, just as warm weather creates the enteric season by increasing chances of contamination, organismal growth, and host receptivity to those pathogens.

But still another intriguing possibility exists, that the seasonal progression of the various diseases with surprising regularity involves a maturation factor among the agents which is governed by season. Dr. Milton Rosenau and I used to speculate whether it was not similar to the progression of the garden: snowdrops, daffodils, tulips, roses, golden rod, chrysanthemums. This obviously is the case with hay fever where the susceptibles exhibit their disturbance according to the time of pollination of their favorite allergen.

The increased activity of the malarial mosquito with the onset of darkness contrasts with the treetop hemagogus which seeks the light and transmits jungle yellow fever during the day. The nocturnal increase in certain social activities of the human segments is thought to have an influence on the occurrence of venereal disease.

The role of the rainy seasons in increasing subsequent insect transmission of malaria is well known. On the other hand, outbreaks of cholera are said to subside with the onset of the monsoon, presumably by washing the contamination from the land and flushing the water channels. In another manner, the dry dust of desert regions that enhances the spread of coccidioidomycosis spores is suppressed by rain, oiling, or paving. The heavy implantation of histoplasmosis in the moist soil of areas is increasingly related to the concentrated depositions by migrant starlings. The role of birds and fowl as a reservoir in the arthropod borne encephalitides has been clearly established; and now the possibility arises that the hibernating bat may serve as the overwintering mechanism. Social factors may contribute simultaneously to the seasonal behavior. Brucellosis and Q-fever are, in this country, largely occupational diseases of animal husbandry, abattoirs and handlers of dusty hides. The great period of excretion is at the time of borning when the discharges are heavily laden; this is true also of louping ill, Rift Valley fever, and others. Relapsing fever of Europe is louse-borne among the unkempt; that of California has been of the well-to-do encountering ticks in their mountain resort cabins. In each instance, a specific agent is involved but the factors responsible in bringing that agent to the infection of man act through the biologic forces of the environment.

Control of such disorders has been to a great extent the development of procedures to interrupt the biological sequence rather than direct action against the agent. On the other hand, yellow fever vaccine has been so efficient that the immunized host can move with impunity in the infected community. Insect repellents have been increasingly effective in preventing transmission. The building of cities, paved roads, and protected dwellings have pushed back the boundaries of malaria and yellow fever. In conjunction, the modern control of food and water has enormously reduced the exposure to imported parasites of extrinsic origin.

Nevertheless, there still remains a long-continued series of communicable diseases for which man apparently constitutes the reservoir, the distributor and the recipient. Tuberculosis, pneumococcal pneumonia, streptococcal diseases, gonorrhea, mumps, measles, influenza, and typhoid are among them. Dr. Dubos, among others, has related the story of the rise and fall of tuberculosis under the influence of hygienic measures. The elimination of tuberculosis in cattle and milk, by slaughter of the infected animals, has essentially eliminated certain forms of tuberculosis in man. The scene has shifted to the point that human tuberculosis has now become a serious risk to the susceptible dairy herds.

The decline of scarlet fever as a cause of mortality began a century ago although the incidence declined comparatively little until recent years. Diphtheria behaved similarly until the widespread application of immunization. (The Health Bills of the mid-nineteenth century and sociomedical attention to the conditions of human living began the decline. But I am firmly convinced that clean water, clean bodies, and clean milk have been the major influences in these earlier trends). Measles and mumps have changed little in their basic behavior over the centuries. Pneumonia was a constant and lethal scourge. The continuing occurrences of these disorders indicates that man and their causative

agents did not develop a satisfactory state of mutual adaptation, at least to the tremendous dosage to which man was constantly exposed. The biologic balance in these instances has been turned in man's favor, but repeated outbreaks emphasize that the agents and the conditions for their pathogenic spread have not been eliminated. In these alterations, treatment of the host by immunization and by drugs have played the major part.

The role of social influences is a significant feature in the biological community. The social tendency toward crowding is one of the most disruptive of a balanced ecology. Nature is said to use famine and disease as a regulatory mechanism. Theobald Smith has said succinctly "Nature abhors a crowd." Crowding, therefore, constitutes an increasing hazard under urban conditions for those diseases which man transfers to man. The repiratory infections represent an unrelieved burden. The viral smog is a component of air pollution as well as the physicochemical elements. These facts are well observed in institutions and military units. Here again, the increased crowding together in the colder season is undoubtedly a significant factor in creating the respiratory season. The 1957 epidemic of influenza illustrated the influence of crowding so clearly. Its presence first became well recognized among crowded refugees in Hong Kong; it occurred in Naval vessels; it appeared in India, for example, particularly in large factory groups; in the United States it was primarily noticed in youth gatherings. It became especially pronounced in school age groups when schools convened. It was not highly virulent but required aggregations for sufficient transfer.

Turning from the influences of natural changes to man-made disturbances, it is well to emphasize that man has almost unlimited capacity to alter his environment and in doing so can create new conditions which favor the establishment of new disorders in the community. In the Yakima Valley of Washington the impounding of water for irrigation provided excellent breeding grounds for the Culex tarsalis which then introduced the virus of Western equine encephalomyelitis to horses and man. All of this was probably the consequence of man's search for gold. The building of large dams has occurred largely without consideration of the effect in dislocating large numbers of animal species, forcing them into new ecological environments and into closer relationship with man. New biologic circuits may then result in the development of diseases new to man and other resident species. The clearing of large areas also tends to interrupt balances with resultant migration of lower animals and their infectious agents.

In our life time we have witnessed the great changes in the behavior of poliomyelitis by use of healthful measures. Epidemics became increasingly greater, involving the older segments of the population. Epidemics became increasingly prevalent in regions where they had not been reported earlier. It seems that hygienic improvements, thought to be a beneficial influence, reduced the prompt fecal infection of infants and children in crowded communities, increased the proportion of susceptibles and the height of epidemics. Modifications in diet might also have played a role by altering the protective flora of the intestines. Vaccination has effectively checked that advance. Nevertheless, the past five years has, in this country, witnessed sharp epidemics in the crowded, unhygienic, poor economic, unvaccinated sections of a number of our cities. The balance has been shifted by protection of the host, but the risk remains and the probabilities of "complete eradication" of the agent seem low since infection can still be maintained. With the suppression of poliomyelitis a whole series of new or newly recognized viruses are moving in as if the reduction of one afforded new opportunity for the lesser. The capacity of certain of these agents to interfere with the establishment of infection by another has been well documented. The variations so commonly observed in the incidence of various diseases among socioeconomic groups serve to emphasize the accompanying differences in their immediate ecology.

Alterations made by man in the general environment at any level affect the biologic scene and impinge upon the human element. For example, biological warfare may be more effective if directed at our plant and animal food sources than at man himself. Alterations in mineral content of soil and water (fluoride, iodide, chloride, selenium, calcium, radioactive materials), agricultural practices (sprays, weed killers, fertilizers), deforestation, are likely to have far flung effects. The introduction of new drugs while enormously helpful for certain purposes may create new risks in resistant species (staph, gc, strep), sensitized subjects, and the disturbance of biotic balances (in the intestines, for example). New foods, new wastes, new weeds, may be reflected in new harmful reactions. New industrial wastes, new political problems affect the ecology of man. Radiation illustrates a known harmful agent whose effects are but now being sought and charted. It influences the total ecology, social, physical, and biological. Its beneficial uses have been nearly overshadowed by its role in the causation of leukemia and other biologic cancers; but in addition, it has become a cancer on the body-politic, and in the minds and hearts of men.

Exploration of space has raised the significant question of contamination of that environment by terrestrial agents which may become established on other planets and confuse the study of life thereon. Conversely, the possibility exists that new, primitive forms of life in space could be returned to parasitize or infect life on earth. The current knowledge of viral crystals and cellular infection by molecules of viral nucleoprotein lets one readily consider the possibility that certain viruses themselves are the most primitive of parasites derived from other forms of life on other planets. Yesterday's paper presents a different set of problems:

> NEW BRUNSWICK, N. J. —(UPI)— Sociology Prof. Harry C. Bredemeier, commenting on what may happen when man reaches the moon, observed:
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> "If we stay there, we'll start mining for ore and building houses and schools which will right away start an argument about whether the housing should be public or private, segregated or integrated, and what's the best way to teach moon-Johnnies to read."

Similarly, penetration of the ocean's depths and the earth's mantle through Operation Mohole offers the possibility of new additions to the biological community. Disposal of wastes in Arctic areas presents new problems. Thus, each projection of man's imagination adds new dimensions to the biological community.

This requires of the environmentalist a true realism, and a mind to anticipate the effect of change on the biological community; to recognize what he sees unclouded by willful resistance; to move with the problems.

Still other biological risks reside in man's changes in his intimate social environment, in his personal habits and his intrinsic pattern of behavior. Nutritional practices have changed so that food is now the vehicle for an increasing number of additives, replacing those removed in processing. The use of antibiotics to stimulate growth of food materials and as preservatives brings harmful side effects. It is impossible to consider our national diet as anything but a discord from the horn of plenty, conducive to increasing the social burden of diabetes, cardiovascular disease, and allergies. The increased incidence of coronary heart disease, of cancer of the lung calls attention to harmful influences of man's own selection. Increasingly man is perpetuating disadvantages to himself by sanctioning unwise, biologically unselective mating which carries on undesirable genetic defects. The mounting risk to culture and progress, to health and peace, present in the unrestricted population bursts may be a social concern but it represents a basic biologic problem. If we improve physical health we must develop the social balance which will permit biological survival.

As earlier indicated, the geographic distribution of disease is governed by a variety of factors. The different areas of the world can be characterized as well by their complement of indigenous diseases as by any other criterion. These localizations are then dependent upon the constitution of the community — whether it relates to inbred characteristics or habits of the population, to the dynamics of its animal ecology, to mineral excesses or deficiencies; in short, to epidemoses involving a web of ecological influences which interfere with maintenance of health, that is, adequate structure and function with adequate reserves.

While we consider environmental health in terms of our progress, one cannot forget that large areas of the world still represent primitive ecology where man is still a closely integrated member of the natural community. The parasitic burden imposed on him by his associations seems to represent a sampling of this external environment.

The experiences of World War II especially emphasize how flimsy is the barrier between our state and the primitive. Jungle warfare brought out the large body of protozoan, rickettsial, and fungal parasites readily available. The disruption in Europe gave rise to great epidemics of typhoid, diphtheria, tuberculosis, typhus, and protein deficiency. Our neglected communities revert readily. Never before has the opportunity been so rich to use our resources for improvement of biological environment throughout the world in the encouragement of international amity. We must face the problems whose solutions we must seek and whose harms we must prevent. W. T. Stace asks "Can he (man) grasp the real world as it actually is, stark and bleak, without its religious or romantic halo, and still retain his ideals, striving for great ends and noble achievements? If he can, all may yet be well. If he cannot, he will probably sink back into the savagery and brutality from which he came, taking a humble place once more among the lower animals." This would mean, incidentally, that all the infectious diseases will again recur, and our great empires of health will crumble into disease. The need, therefore, is to educate ourselves and the public to view our problems as participants in the ecology rather than as remote observers of the biological environment. Then the vigor for maintenance of health will be a stronger part of our national assets toward improvement in a world of contention and confusion. In doing this, we must follow the guide of preventive medicine and its applications.

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# Chemical Aspects of Environmental Health

Many professional and lay people are well aware of some of the characteristics and complexities of the natural and the man-made environment from the aspect of its chemical components. Certainly all of us have heard and read many things about the chemical hazards of modern life, some of which have been informative, some challenging, and some, I regret to say, designed more to attract the attention or to loosen the purse strings of an apprehensive public than to shed clear light on the subject. I consider it a duty and privilege, therefore, to examine objectively some of the facets of the general problem, and to try if possible to group them so as to visualize certain relationships which might render them accessible to investigation and, ultimately, to the required degree of control. I say the "required" degree of control, because control limits freedom to explore as well as to act in other ways. Such freedom in our society is a precious ingredient which is decreasing rapidly. Indeed, in my view, the rate of decrease is unnecessarily rapid, at least in relation to the type of public safety for which this assembly and the professions here represented have a large share of responsibility.

In the long and, for the most part, obscure past before man ventured forth on his own experimental career nature carried out a huge series of general and localized experiments in which men were reacted upon and perished, or survived with adaptations. We should not be reckless in our lesser experimentation, in which we may again as we have before unleash strange powers before we understand their effects and are able to control them. Nevertheless, we should not forget that there is a vast resilience in humankind, and that we still require knowledge gained by observation and experience. Only rarely, if ever, can we anticipate the consequences for good or evil of restrictive or evasive acts which are motivated by anticipatory apprehension. There is a thin line of distinction between timidity and prudence, but we should be truly humble in our management of men and affairs in small matters and, even more so, in those which are large in their potentialities for widespread social and economic exploration and benefit. It is an interesting commentary on the human mind that the caution with which, individually, we approach material matters about which we know much is cast to the winds when, collectively, we undertake social and political actions in which definitive knowledge plays so little part in competition with tribal, religious, and personal loyalties and biases.

## Sources of Chemicals in the Environment

Only in fairly recent years have we created elements, mostly in small quantities, which do not exist naturally on this planet. We have, however, produced many chemical compounds that do not exist in nature, and we are engaged, almost feverishly, in research and development in a wide variety of directions, in preparing and examining for new uses more and more of such new chemical compounds. From the air, from the sea, from the earth, from underground waters, from farm and forest, and from fossil remains, we draw simple and complex materials, split them, purify them, and combine them in old and new ways to produce new chemicals, the physiological effects of which cannot be anticipated through previous experience. It is well known that the human organism is incapable of detecting the presence of certain noxious forms of energy which would seem not to have occurred in the normal environment of primordial man in concentrations or intensities sufficient to call forth specific nervous receptors or to result in defensive physiological mechanisms. Whether such end-organs and mechanisms can be credited to the operation of obscure evolutionary processes which were initiated by environmental stimuli, the fact is clear that immune and other defensive mechanisms of many types are activated in the individual by both general and highly specific chemical stimuli from his environment. It may well be that the lack of such mechanisms is an important factor in unusual responses of men to noxious stimuli that they have not encountered previously.

Of lesser significance, perhaps, than our new contributions to the chemical environment, but

not to be ignored, has been the intensification of the environmental impact of many natural substances, whereby materials (and also radioactivity) which originally gained access to the human body in beneficial or harmless traces have been made available for absorption in greatly augmented and often noxious concentrations. This applies with special frequency and importance to a large number of minerals and to their individual components, many of which were buried deep in the interior of the earth, or were thinly distributed as highly insoluble residues in its outer crust, or were deposited in forbidding or isolated areas. Human curiosity and human needs have unearthed numerous varieties and huge quantities of such minerals, have subjected them to crushing, grinding, and melting, to physical and chemical fragmentation into their components, and to the reassembling of their components into a galaxy of new products. By such means the original minerals and their components not only have been concentrated in the human environment but also have been converted into dispersed and dispersible solids, liquids, and gases that may enter the human body in abnormal and often dangerous quantities by way of the respiratory and alimentary tracts and through the integument.

Running through the entire fabric and activities of modern life is a chemical complex, with its mines and its processing of minerals, its factories and their myriad processes and products; its agriculture and animal husbandry and methods of multiplying, salvaging from pests, harvesting and preserving their products; its fuel-consuming and smoke-discharging facilities for the transportation of raw, intermediate and finished materials, and for the conveyance of an increasingly large proportion of its busy population; its homes, public and private buildings, stores, shops and their equipment for heating, cooling, cooking and waste disposal. All these and many other activities pour a steadily increasing stream of chemicals into the air we breathe; upon the land from which come our vegetable and animal food products; into the water which we use in preparing food and beverages, as well as that which we drink; and, finally, through a multiplicity of channels into the processed and packaged food which we consume. Some portion of each of the ten thousand and one chemicals which we make and use or discard as wastes finds its way into the human environment and thence into the complex system of organs, tissues, and biophysical and biochemical reactions which comprise living man.

## Types of Chemicals in Relation to Human Hazard

Considered in terms of their physical state, raw or finished chemical products are introduced into the environment in the form of solids, liquids, and bulk gases, as concentrated or dilute solutions in a great variety of solvents, and in dispersed, particulate form as dust, fume, mist, vapor, and gas. Each of these physical states or forms possesses certain qualities which determine its means of external access to the human organism, and, to a considerable extent also, the speed and degree of its penetration into the inner organic medium of the body. Thus the materials may come in direct contact with the integument of the body, which they may injure and then penetrate, or through which, as the appropriate type of solid, liquid or gas, or as dissolved materials in the appropriate vehicle, they may pass without injury at variable rates. The materials may be dispersed in the air as dust, fume, mist, vapor or gas, and so gain entrance to the respiratory apparatus where they may be absorbed or from which they may be ejected with little or no absorption. Or, finally, solid or liquid particles, according to their size and mass, may be trapped in the upper respiratory tract and swallowed, and chemicals in other forms may be ingested with food and beverages or as contaminants of fingers or other objects put into the mouth.

It is important to recognize the fact that, except for the cellular structures which line the alimentary tract and are, themselves, subject to injury, the main organic structures of the body may be affected but little or not at all by materials in the digestive tract. The latter is, in effect, a tube to be traversed and to yield up its absorbable contents to the portal circulation and thence to other tissues of the body. But many of the materials therein are unabsorbable or but slightly absorbed, and it is only to the extent of their absorption that such materials can enter into the internal chemical system of the body for benefit or harm. Their physical and chemical resistance to the attack of digestive juices and other materials in transit — that is, their structure and state of subdivision, their chemical reactivity and their solubility — determine their potentialities for absorption. The speed of their passage from one end of this tube to the other is the final factor, and one that is of much greater importance than is usually recognized, in the degree of their absorption. Certain mineral components or contaminants of food and beverages are almost entirely unabsorbable under ordinary conditions, largely because their commonly available compounds, or those formed by their reactions with the common constituents of the food and other contents of the alimentary tract, are essentially insoluble.

## Injury by Contact

1. In considering the effects of direct contact of chemicals with the human body, one thinks first of the skin and of certain common injuries to the skin. Among those are immediate and localized destructive damage through contact with corrosive or highly injurious substances; less severe irritants cause redness, pain or itching, and swelling, followed, after discontinuance of the contact, by the disappearance of the acute signs of injury and usually by some desquamation of superficial layers of the skin. There are also more chronic forms of injury, which progress slowly with the continuation of the contact, or which develop slowly out of brief contact, and regress slowly after its termination. In addition there are materials which, at first, cause no injury, but sooner or later induce a state of "sensitization," through which further contact, perhaps even brief contact with minute amounts, causes an acute and sometimes violent reaction in the skin locally or even generally. There are also specific substances which act as allergens to induce mild or severe systemic manifestations of disease. And, finally, there are materials, as well as external physical agents among which sunlight must be listed, which, when they come in contact with the skin in sufficient concentration and with sufficient frequency, induce benign and malignant tumors.

The foregoing reactions to injury, with the exception of the general allergic type, and perhaps that associated with tumor formation, may or may not involve the penetration of the injurious material through the skin and into other tissues of the body. On the other hand, a material which enters into contact with the skin may penetrate through it and be distributed to many or all parts of the body without causing even a slight perceptible effect on the skin itself.

2. Effects similar to those sustained by the skin are observed in the membranes of the respiratory tract following direct contact with chemicals, with slight modification due to the different composition and texture of these membranes. They fulfill much the same role as the skin, with respect to materials other than vapors and gases, as a barrier to the entrance of foreign materials into the body. This system of lined tubes is, for all practical purposes with respect to the other organ systems, the outside of the body. Destructive materials injure these tubes as they do the skin, with remote effects that differ widely from those associated with damage to the skin, because the vital ventilatory functions of the respiratory tract are interrupted, with serious consequences to the entire organism. Irritant particulate substances often injure only the respiratory membranes, and maim or kill, not through remote effects in other tissues, but because the local injury hampers the gaseous exchange in the lungs and suffocates the body.

Low grade irritants damage the nasal passages, the tracheobronchial tree, or the lungs, and often no other organ system of the body. Inert particulate materials, of which carbon is the best of the few examples of essentially harmless materials, collect in the respiratory tree and in the lymphatic system that provides drainage, and discolor these tissues but do little else, so long as the quantities involved are not sufficient to occlude airways or grossly to overload the mechanisms involved in their clearance. Many other solid particles, as dust or fume, produce effects which range all the way from insignificance during an entire lifetime, to varying degrees of dysfunction and disability after many years of continuing exposure, to acute illness and sometimes death after some hours of exposure, as the result, solely or primarily, of acute or chronic pathologic changes in the respiratory tissues. Silicosis, asbestosis and berylliosis are among the more serious manifestations of dust in the lungs (pneumoconiosis), and there are other forms which are benign or only partially disabling. In association with pulmonary infections, their injurious effects may be greatly augmented. In the respiratory tract, also, allergens sometimes induce purely local effects that may be serious because of the interruption of the gaseous exchanges in the tissues.

Finally, benign and malignant tumors in various parts of the respiratory tract are produced by sufficiently prolonged contact with specific substances under suitable conditions. Some of even the malignant tumors may be purely local, it seems, in their pathogenesis and development, until they metastasize. This and other statements concerning the malignant tumors must be made with a degree of caution, for until the neoplastic diseases of the respiratory tract are more fully understood, almost any flat statement concerning their etiology and pathogenesis must be viewed tentatively. With the exception of some pulmonary cancers that are associated in their origin with certain fairly definitive occupational factors (exposure of miners to certain radioactive ores, or of chemical operators to chromium under certain conditions, or to some substance derived from or associated with the manufacture of isopropyl alcohol, or to finely divided nickel or some compound or contaminant of nickel, or to asbestos itself or to some constituent of this commercial mineral), the genesis of the malignant tumors of the respiratory tract of man is uncertain.

Careful applications of statistical and epidemiological procedure to certain aspects of this

problem in the general population have disclosed certain facts and relationships which justify sober consideration. At best, however, we are operating here in the realm of probabilities and reasonable inferences, while at worst, public anxiety is being promoted to no advantage by irresponsible speculation. Much too easily do certain of our colleagues generalize from specific and sharply limited facts, as for example, the carcinogenic characteristics of individual chemicals as revealed by the exotic responses of a single species or strain of experimental animals. Even less restrainedly, do some of them direct suspicion toward whole classes of compounds in which certain individual members have been found to be capable of causing malignant tumors in certain animals. If this criticism is said and meant to appear as sharp-edged criticism, it is nevertheless tinged with regret that it must be said in order to restore, if possible, something of balance into a sadly distorted scientific posture, in this field of public health. When we find ourselves confronted with legislation and regulation which undertake to control a speculative public hazard on the basis of unexplained and unexplainable experimental observations on animals in the absence of even suggestive human experience, it is high time that we examine the sources of legislative advice and leadership, and the social and intellectual climate which permits the substitution of an empty custodial gesture for effective promotion of the public welfare.

3. The access of environmental chemicals to direct contact with the tissues of the mouth and the digestive tract differs in certain important respects from that of their contact with the skin and respiratory apparatus. That which enters the mouth, in the gross sense, is determined largely by the individual, and not by the chance of its occurrence in the environment. Moreover, the digestive apparatus, by design, is a retort for the preparation of materials for absorption, into which solvent water, emulsifying agents, chemical reagents and catalysts are poured in profusion, and hours of time in transit prolong their influence in the preparatory processes. Under these conditions, simple and direct injury to the alimentary tissues, without coincidental absorption of noxious materials and damage to more remote organic structures and mechanisms, is uncommon. Indeed, this type of injury is seen rarely except in association with suicidal or homicidal attempts. Such injuries are more serious and more frequently lethal than those which affect the skin, because of the greater vulnerability of the circulation in and along the alimentary tract, as well as because of the more intimate relationship of the latter to other internal organs. The reverse is true, however, in relation to the respiratory tract, for alimentation can be suspended much longer without bringing death to the organism than can respiration.

The acute response of the alimentary tract to chemicals which induce nondestructive irritation is that of hyperfunction, especially increased peristalsis, and an effect of this is a more rapid elimination of the irritant from the tract, thereby shortening the duration of contact and lessening the damage, although hypermotility may increase the threat of hemorrhage. The more chronic effects of chemical irritation of the alimentary tract are likely to be spasticity and other forms of dysfunction, in association with structural changes which vary with the nature, degree and site of the irritation. It does not appear that these structural changes (pathology) are very significant unless they are augmented by gross nutritional abnormalities or by infectious processes.

The allergic reactions of the alimentary tract to chemicals differ appreciably from those of the skin and the respiratory structures, not so much in the basic mechanisms involved but in the overt results. Hyperperistalsis and the pouring out of water with variable amounts of mucus are likely to be the observed effects.

Certain other local effects, as in the case of the skin and the respiratory tract, are the result of the absorption of the offending chemical into the tissues of the alimentary tract. Such local absorption may result in the stimulation or inhibition of secreting glands or of the smooth musculature, either directly or through the mediation of the local nervous supply.

The relationship of tumors of the alimentary tract to contact with environmental chemicals is too uncertain to justify comment.

### Intoxication Through the Absorption of Chemicals

The responses of the skin, the respiratory system, and the alimentary tract to the absorption of noxious chemicals that possess little or no destructive or irritant properties in the concentration in which they reach these tissues, are likely to be limited solely to functional disturbances in other systems of the body. As indicated previously, there may be local effects due to local absorption, and there may be local muscular and glandular responses which are initiated in the central nervous system or in the endocrine glands. In the main, however, the essential characteristics of systemic intoxications following the ingestion of chemicals are determined by the functional reactions and the physical and chemical responses of other organs and tissues. These, through controlled experiments and intelligent appraisals of epidemiologic and clinical

experience, come to be grouped into patterns that serve to identify the presence, in the host and in the environment, of specific types of toxic substances and, sometimes, of unique individual compounds that are known to induce certain effects or to have certain pharmacodynamic characteristics. Only rarely are there demonstrable or definitive gross pathologic changes in the living organism which lead to the identification of the absorbed material, and, unfortunately, the microscopic or chemical (analytic) examination of accessible tissues or body fluids (blood, urine, spinal fluid, etc.), tends to yield little specific chemical and physical properties.

The importance of many of the foregoing facts and details may not be apparent in the general context of this discussion, but they will be found to be pertinent in the consideration of the means by which chemical components of the environment are to be detected and identified. Most of the toxicological procedures of an earlier day were concerned with the determination of the causes of accidental, suicidal, or homicidal fatalities. Such determinations continue to be part of the professional responsibilities and armamentarium of the toxicologist. But the toxicological problems of the present era are much broader, more numerous, and almost infinitely more difficult to solve. One significant obstacle is worthy of special attention, since it requires either the application of new types of investigative approaches, or a drastic modification of the methods whereby epidemic or endemic diseases of microbiological origin have been elucidated.

It is one thing to recognize the existence of illness within occupational groups and to determine its nature and origin in an occupational population in which the principal environmental factors have been known for some time and in which the responses to these factors have been the subject of detailed medical observations. It is quite another matter to determine the type and extent or even the existence of injury or illness in a population that is being subjected to intermittent and irregularly distributed exposure to a large number of chemical agents in highly variable individual and composite concentrations, in food and beverages and in the air. Under these circumstances, the etiologic agent or combination of agents which exists in potentially injurious form in the multiphasic environment is indeterminate, if not indeterminable, while the pattern of the individual and collective response to injury is confused, almost beyond hope of interpretation, by the multiplicity of potential effects with their possible summations, antagonisms, and potentiations.

It must also be recognized, although it should not be permitted to introduce anticipatory frustration into the deliberation of physiologists and epidemiologists, that the total response to the combination of a large number of subliminal or barely effective noxious stimuli, may conceivably be, or have the appearance of being, an utterly nonspecific impairment of general physiological function. We are all aware of vague variations in our sense of well-being from time to time, and these are not always susceptible of physiologic interpretation. I have encountered such a phenomenon in several persons whose work had involved occupational exposure to lead under conditions which had held them at or very near the threshold of hazard, in terms of their body burden of lead, for prolonged periods. These persons were not ill, as judged by inability to work, or by acceptable medical or physiological criteria, but after months of observation and investigation, during which they sustained no further occupational exposure to lead and their body burdens of lead diminished to nearly normal levels, these men expressed themselves as not having known for some time how good they could feel. These statements must be regarded with skepticism, in relation to the influence of the one variable on which they and I were concentrating so intently, in view of the complex factors that are known to affect individual states of coenesthesia. Nevertheless, they have impressed me with the appearance of validity in one or two instances to such an extent as to cause me to lean a bit toward an otherwise factually unjustified margin of safety in the standards to which I adhere.

Some such problem arises in any attempted appraisal of the effects of exposure to and absorption of a multitude of chemicals. It is a difficult problem, and one in which the attitudes and motives of the observed and the observers need to be examined on the background of the preconditioning of both by the barrage of information and misinformation with which they are being bombarded. Even if this aspect of the matter is discounted, as it must be until it can be examined by objective methods, this field of investigation is sufficiently difficult to challenge the best of our talent. For here is a situation in which neither etiologic agent nor disease entity provides a single or strategic point of attack. Both are unknowns, and either is to be appraised in terms of the other which is equally as vague. We shall return to this matter a little later. Suffice it here to suggest that this is the point, however, at which the novices and amateurs should bow out of the field, or, at the least, acknowledge their limitations, and restrain themselves for a time, from the issuance of pro-

nouncements. Opinions on this subject, at present, are not helpful unless they are accompanied by useful data, and the place for both is in professional and scientific publications.

### Considerations of Attitude and Strategy

The complexity of the chemical environment of modern man in highly industrialized countries may be a terrifying prospect, from which many persons in the population of such countries would seek to escape. Some may believe that we can restore the "good old days" of simple living, ignoring the fact that our numbers were once comparatively small; that we were fed, clothed and housed with relative ease; that convenience, comfort and the luxuries of leisure, travel and a full life could be sought and had but by a few. This is not to suggest that chemistry is solely responsible for our environmental problems or for the wider distribution of the opportunities that enable the citizen of modern industrial nations to share in the good things of life.

In the headlong and highly successful pursuit of chemistry and its practical applications, we have created many hygienic problems. It is not surprising, but it is highly significant, that we have been too busy developing and producing chemicals we have needed to be concerned sufficiently with the risks that come in their train. We now find that these risks, some of which have been dealt with by half-way measures or none at all, have multiplied, and some are out of hand.

The responsibility for this situation cannot be laid solely at the door of business and industry, nor upon the chemists who are engaged in industrial research, development, and production. The fault lies in an entire society that is willing to accept the benefits of greater comfort, convenience and speed, and the sense of affluence and power that flow from these benefits, without concerning itself with their less satisfactory accompaniments, except to protest vigorously when they strike home — if I may use this expression in a literal as well as its idiomatic sense. More appropriately, such blame as may justly be credited to lack of foresight, should be laid at the door of those who might most reasonably have been expected to possess this quality in matters related to the national health. Every profession represented in this conference, and especially those concerned with professional education in the disciplines related to health, shared in this default. It may be said in all truth and fairness that to the extent that professional training in the medical and sanitary engineering sciences and practices fails at present to concern itself effectively with the health and the special threats to the health of the people in this technological era, it is still blind to its responsibilities. For now the time may run out, and we have a great deal of neglected ground to cover.

If the time is short and the distance great, it can nevertheless be covered. Certainly if by supreme effort at fantastic cost, men can hope to overcome the exotic hazards of outer space, they can expect confidently to deal with those hazards which they themselves have created in their terrestrial environment. And surely, the technical knowledge and skill that can synthesize a new chemical, find the practical application that justifies its use, and develop the process by which it can be produced in quantity, can surround it with adequate safeguards to human health. This, with rare exceptions, should be comparatively easy to achieve, almost, as it were, with the left hand of technical competence, but it will not be done automatically (or even by automation). It must come purposefully and as a well designed effort, according to appropriate specifications. It must be built carefully and skillfully into the process and into the fabric of the commercial development and exploitation. And since it will often be costly, it must be regarded as a regular and essential part of the enterprise. In the application of this principle, it may be profitable to give thought to the strategy that might be employed in dealing with the large proportion of the environmental hazards that derive from chemicals.

The strategic point at which the most useful information about individual chemical hazards can be obtained is in the chemical industry. It is likewise the point at which the most effective control of hazards due to chemicals can be applied. The reasons behind this strategy are simple and fairly evident. Obviously, there is no single point, but certain common features condense the multiple foci into a functional site of attack upon the manifold problems.

Almost all of the chemicals of the country are made and handled in its chemical plants. In many instances, they begin their careers as chemical commodities, where often they have been synthesized for the first time. Here they are developed and handled by skilled people who have some interest and experience in protecting themselves against exposure to new chemicals with unknown physiological properties. Here, with increasing frequency, promising materials are subjected to toxicologic examination, or farmed out for toxicologic investigation.

As these materials are examined further for their commercial potentialities, and as those suitable for exploitation are developed and manufactured, larger numbers of individuals, some of whom are less skillful and less cautious, are subjected to exposure under conditions which often reveal potentialities for harm. At best,

specifications for safety, arrived at through animal experimentation, are applied under environmental and medical monitoring which serves to disclose the facts with respect to the nature and degree of human tolerance. Ideally, this is done under conditions which provide information about the specific material uninfluenced by simultaneous exposure to other potentially dangerous chemicals or environmental conditions. Any unusual or untoward effects sustained by individuals or occupational groups are likely to be limited in severity and duration, but every item of information obtained by such experience becomes part of the dossier that establishes the toxicological background of the material as well as the metes and bounds of human hazard.

Such a sequence of precautionary and informatory procedures is not always followed, while short-cuts of one kind or another often defeat the intended but not well-sustained purpose, and casualties of variable severity result. It is well known that the rough and ready procedure of trial and error, in these matters, was the common practice of American industry prior to the third decade of this century, and that out of such experience American physicians and toxicologists learned much which stands them in good stead as horrible examples. What is not so well known is that some portion of American industry still operates on this principle, and that a larger proportion of the industrial community regards industrial health as a desirable goal but has not found the means nor the professional guidance that could achieve it. Industrial management must bear some share in this failure, but at least an equal responsibility for it must be credited to the preoccupation of the health professions with other problems and their ignorance of and indifference to the preventive aspects of occupational health.

In any case, however, opportunity presents itself and can be grasped by an alert and disciplined industrial society. Most of the useful information which we possess concerning the effects of chemicals on man have come from this source, and much more and better information can be obtained by well-directed effort.

There is a second feature of the industrial site that gives it strategic importance in relation to chemicals. At this site, multiple as it may be, is found a concentration of technical personnel accustomed to meeting specifications applicable to process and product. When additional specifications are added to a process, such as those concerned with the safety of the exposed personnel of the plant, and with the retention within the confines of the manufacturing plant of materials that were once discarded by the easiest possible route as unreclaimable wastes, such specifications can be dealt with in the same manner as the others. The stack effluents can be controlled within certain limits with relative ease; and if circumstances call for extraordinary measures of control, there are methods and equipment for doing so, and still better methods can be developed if necessary. Likewise, water used for process, temperature control, and for the drainage of residues, sludges and other wastes, can be processed as circumstances require by methods that are applicable or can be adapted or developed, before such water is released from the plant. These practices, of course, are not new. Many responsible and farsighted people in industry have been following this principle. Indeed, it is through the success of their efforts in many difficult situations that one may know that the principle is applicable.

At times the salvaging of waste materials has turned out to be profitable, and sometimes the value of the salvaged material has tended to balance or at least to reduce the cost of the measures required to effect the salvage. This cannot be counted on, however, in many situations, and some considerable portion of the enormous expense that will be incurred by industry generally in achieving the desired end of retaining industrial chemicals within the premises will have to be absorbed as part of the cost of operation and charged against the conservation of our national resources in lands and waterways, and in the health, comfort and aesthetic sensibilities of our population. Various forms of coercion, such as legislation and litigation, have exerted influences in this direction, and these, no doubt, are necessary to bring into line those who have neither the willingness nor the wisdom to conform to the requirements of good citizenship and neighborliness, as well as those who are under a burden of economic stress.

There is yet another principle which is being extended under the influence of changing viewpoints of corporate responsibility, as well as economic, legal and legislative pressures. Many useful precautionary measures now accompany chemical commodities in the course of their transportation, distribution, and use. Few of these are adequate, and here again opportunity is afforded for well designed and effective procedures for the protection of carriers, warehousemen, intermediate processors, and ultimate consumers of chemicals.

The strategy proposed in the preceding paragraphs has one important weakness, in that it can be expected to yield highly favorable results only if the supply of medical and technical personnel trained in the techniques of occupational hygiene can be greatly augmented, and if their

distribution throughout industry can be greatly improved. Following such developments, the major problems of the pollution of air and water supplies as these arise from industrial sources (these are not the only sources), can be solved by preventive measures applied to these sources on the basis of information which is now available together with that which can be obtained by comparatively simple but persistent investigations in the future.

Despite the adequacy of the methods of control of the chemical hazards that originate in industry and remain within industrial purview and responsibility, there will be many uncontrolled hazards and many that will defy control. A useful chemical, such as a solvent, will find its way into small shops and dry cleaning establishments, and into numerous households as a spot remover. A pesticide, be it ever so well-labeled, will get into careless or uninformed hands in large and small establishments, on the farm and garden and in the home. Do what you will, dangerous chemicals — and most of them are dangerous under appropriate circumstances — will remain dangerous, and when distributed widely will take their toll in illnesses and fatalities. On this account we have poison centers for the dissemination of information and advice in emergency. It is an amazing experience to be so situated as to know what goes on in such a center, and to learn how frequently small children gain access in one way or another to the chemicals and drugs in the household. The moral of this situation, as of the others mentioned in this paragraph, is that one can supervise the distribution of chemicals until they reach the ultimate consumer, after which the problem is his.

In connection with the chemical hazards in the home, I cannot fail to refer to the occurrence of lead poisoning in children up to three or four years of age, and the tragic consequences associated with their ingestion of paint of high lead content that has been applied on the interior woodwork of homes and on furniture. Such cases occur for the most part in old and poorly maintained housing, and in association with inadequate care of the children. There appears to be a belief that this is not a serious problem except in Baltimore, Cincinnati, New York, and a few other cities where effective facilities for case finding are available and in use. The latter factor is the important one in establishing the incidence of this often fatal disease. Lead poisoning is found among the children in the poorer and older areas of all American cities built before the first or second decade of this century, if it is looked for with a seeing eye. The form of the intoxication differs in many of its characteristics from that usually seen in the adult, and the diagnosis is not made by physicians who have not had experience with this disease or been well indoctrinated in its characteristics.

We have also unsolved problems relating to the chemical contamination of air, water and food, as the heritage of the years of *laissez-faire*, and regardless of how well we may learn to handle these in the future, they continue to plague us now. What is the extent of the need, and how much in money and trouble are we prepared to exact from our people in order to meet that need? Perhaps the question should be phrased to ask how much cost and inconvenience the people will endure, and how well will they perform their part of the necessary action. It appears, for example, that the best devices for the elimination of some of the most troublesome materials from the exhausts of motor vehicles will increase the cost of an automobile and also the expense of its maintenance. Maintenance will also be a source of inconvenience to the owner. Can the public be brought to accept this responsibility? These matters involve the acquisition and distribution of knowledge and technical skill, but they go beyond science and technology into the behavior of people, and into the ways and means of achieving the desired end. In the final analysis, whatever else is done, means must be found for the detection and the assessment of the significance of chemical hazards. It is especially important that we develop techniques for the appraisal of vague and insidious effects, if any, of the various combinations of chemicals which occur in low concentration in the general environment. Which are the offenders, and to what extent must they be reduced in concentration so as to be harmless? What standards can we develop, substantiate, and maintain?

## The Detection and Appraisal of Chemical Hazards

It is possible at this time to speak only briefly of five disciplines that appear to be necessary and applicable to the elucidation of the significance of chemicals in the environment: toxicology, analytical chemistry, occupational medicine with specific reference to its toxicologic aspects, epidemiology, and biostatistics. If my use of the names and implied definitions of these disciplines is arbitrary, my meaning and terms of techniques will nevertheless be clear.

*Toxicology:* The toxicology of our day, as applied mainly to industrial chemicals, has become an elaborate scientific activity which, in its practical application, has tended to go astray both technically and economically. A complex series of conventional procedures, associated with a formidable jargon, has come into being.

Such terms as "acute toxicity," "sub-acute toxicity," "chronic toxicity," "percutaneous toxicity," "L.D.50," "long term feeding experiments," "increased organ weights," "fiducial limits," the "T test," and many others are the bane of scientific reporting, as the designated procedures are obstacles to the thoughtful design of experiments to achieve pertinent information in the specific instance. We seem to have forgotten why these experiments are performed, other than to satisfy the neat pattern of completeness that existed within the mind of the investigator in the laboratory.

The height of absurdity is reached as we find ourselves soberly pondering the significance of a conventional mathematical expression of a borderline probability, concerning the effect or the lack of effect of a given experimental procedure, as applied to white rats. The issue is not what happens to white rats, under the artificial conditions of the laboratory, but what will affect man under the variable conditions of life. The absurdity here, let me hasten to say, is not the use of white rats in anticipation of human experience. It is, rather, our misuse of a statistical device for determining whether the refinements of our observations have yielded significant or fortuitous results, and our growing addiction to a mental "sleight of hand" act, whereby we translate an artificial effect (or lack of effect), sustained by one (or more) species of experimental animal, with mathematical precision to the last decimal point, into a predicted human effect. So great has become the urge, in terms of both professional and official responsibility, to ward off any threat, however tenuous, to a public rendered anxious by lurid publicity, that we are attempting to magnify the meaning of our work by spurious trappings of science.

What can be learned by animal experimentation, toward the interpretation, in advance of experience, of the potentialities and the characteristics of human intoxications? Much, in terms of the avenues through which absorption may occur; much, concerning the sites and the general nature of the injury induced; much, therefore, but not all by any means, of the behavior that may be expected of the human victim of intoxication; and much indeed, if we can but decipher them, of the mechanisms whereby specific or general tissues or functions of the body will be affected in their internal physical or chemical reactions. The principle involved is that of looking forward both realistically and imaginatively to man, and visualizing how, on the basis of the portal of entry, we may protect him by preventive measures; how through some foreknowledge of functional responses and pathogenesis, we can recognize the earliest manifestations of intoxication so as to protect the individual and derive environmental specifications for the protection of the group. Environmental toxicology is but the handmaiden of environmental hygiene, in both its engineering and clinical aspects; it has not visualized nor achieved its goals until it has sought out and indicated procedures for environmental control according to human specifications and specific physiological measures for the recognition of impending human danger before it strikes, or for the diagnosis of disease in an early and completely reversible stage. Such goals are not to be achieved by following a formulation of experimental techniques, but by the examination of every toxicological problem with the insight of broad physiological experience, in a persistent search for the strategic point or points of attack.

Something should be said in a discussion of experimental toxicology in relation to human hazard, to emphasize the importance of extending these investigations to include the experimental observation of the responses of human subjects. There is no adequate substitute for information of this type, and if there should be some hesitation, on ethical grounds, to engage in such human experimentation, it should be evident that the risk involved in a carefully controlled experiment, surrounded by satisfactory safeguards, is of a very different order of magnitude than that involved in the less well-controlled conditions under which the same material is introduced into production or use. The policies and conditions under which human experimentation can be conducted with propriety and with benefit to society, unalloyed by injury to experimental subjects, have not been defined in detail. Suffice it to say here that the subjects should always be under the direct supervision of a competent physician, and that the traditional, ethical relationship of the physician to his patient should be the determining policy.

*Analytical Chemistry:* Little need be said here concerning the importance of analytical chemistry in the appraisal of the chemical aspects of the human environment, in the maintenance of quantitatively precise conditions, in the artificial environment of the laboratory to which experimental animals or human subjects are exposed, and in the determination of the fate of chemicals introduced into the animal (or human) organism. It must be emphasized, however, that this is not just a clinical service to be rendered to the investigator of biological phenomena by anyone who happens to have been labeled as an analytical chemist. The chemist who concerns himself with even the inorganic constituents of biological material must be steeped in the prob-

lems which he is helping to solve, so as to understand, among other matters, what is required to obtain valid and representative samples for analysis. He must be a consultant in the work, and not merely a technician, and he must be able to develop the required analytical procedure when such is not available. He should also be included in the consideration of the design of the experimental program, so as to clarify to his other associates the potentialities as well as the limitations of his contributions.

There has been some tendency, now happily diminishing, to look at but one side of the problem of environmental health at a time. One group of interested persons, representing the medical (or biological) disciplines, has considered it sufficient to investigate the injurious effects of exposure, for example, to atmospheric pollution with chemicals, relying, evidently, upon their ability to interpret the effect and therefore to identify the agent. The remarkable naïvete of this idea has been exceeded only by that displayed by the representatives of the physicochemical disciplines, who have appeared to assume that the identification of the chemicals in the environment (not all of them, and not always with analytical precision or a valid program of sampling) should be adequate evidence of human hazard or the lack of it. Time and money have been squandered in these efforts, but some ground has been gained through the demonstration of the fact that the task cannot be done in that manner. There must be skillful performance in all of the fields of closely coordinated effort if we are to find valid solutions for our chemical problems of environmental health.

*Occupational Medicine:* The relationship of occupational medicine and hygiene to the appraisal of the chemical hazards of industry has been referred to previously, and need only be mentioned at this time. There is a recent development in the practice of medicine whereby those who are trained and experienced in occupational medicine, and especially those whose professional activities are carried out in the chemical industries, are being consulted as to the methods and procedures involved in the early identification of chemical injuries and intoxications. This situation will be intensified to the extent of the growth, development and differentiation of the chemical industries. It can confidently be expected, therefore, that an even greater proportion of our information about the chemical intoxications will come from physicians and environmental engineers in industry in the future than it has in the past. It is highly important, it seems, that this fact should be recognized both by the industrial leaders of the country and by physicians and medical educators. This field of medical practice is grossly underdeveloped at present in the United States, in view of its potentialities for contributing to the health and welfare of a large segment of our population.

*Epidemiology and Biostatistics:* As a part of the training and the subsequent practice of occupational physicians and that of their associates in the engineering aspects of occupational hygiene, the methods of investigating the health of man in his occupational environment and the effects upon health and well-being associated with environmental conditions are the primary subjects of study and professional performance. Statistical considerations have their place in the regimen of training and daily work, as do all of the other disciplines whereby health and disease are differentiated and disease is identified in satisfactory and often quantitative etiological terms. This combination of disciplines might well be rolled into one and designated, for present purposes, as epidemiology, since it is implemented, if at all, by all of them. The combined techniques of epidemiology, in this relationship, have not been worked out satisfactorily by the professionals, and there will be future developments, both of method and of fact, that seem only vague possibilities at this time.

In a recent conference on this subject at the National Institutes of Health, many experts participated in a consideration of the applications of epidemiological method to the new problems of the occupational environment. The discussion ranged round and round a difficulty which was not resolved and, under the existing circumstances, could not be resolved. The methods for dealing with observational and experimental data are available and adequate, but there is no method by which inaccurate and scanty data can be rendered more precise or more numerous than they are. The difficulty of obtaining the right answer, or any answer at all, resides not in the methods of dealing with data, but in the data themselves. In the field of environmental health generally, and specifically in that segment which is concerned with chemicals, we require precise data; analytical data that can be obtained by methods of precision and gathered in sufficient number to be representative of environmental conditions; clinical data that can be obtained correctly and recorded accurately by knowledgeable and skillful physicians, in sufficient number and variety to be representative of human responses to the specific environmental stress. Without these, we shall wonder and wander; with them we shall be able to relate them one to another, and to derive meaningful answers.

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# Physical Aspects of Environment

## Physical Factors of Presumed Importance

Land, water, and air have always been the receptacles of man's wastes. Their capacity to produce disease, when abused, has been recognized since prebiblical days. The longer they have so served, the greater the dependent population, the wider the industrialization and the abuse, the more necessary has their management become. The scientific and technologic problems thus created have multiplied the economic, social, and political issues.

Those who hope that the millenium will bring complete elimination of man's domestic and industrial wastes from the land, water, and air are less than realistic. Man gives no indication of being either willing or able to live in a sterile vacuum, where other less obvious threats would undoubtedly emerge. His choice, therefore, is to select as intelligently as possible those adjustments in the physical environment which will reduce disease and promote comfort.

With the rapid emergence of new waste materials, whether exotic organic complexes or the byproducts of nuclear fission and radiation, the challenge changes little in principle. Control has always required intensification of scientific inquiry; formulation of new standards for measurement and appraisal; search for more specific evidence of biological impact; and reorientation and expansion of administrative structure, practice, and budget.

These similarities are pertinent, whether we deal with dilution or disposal, siltation of streams or atmosphere, rises in temperature of rivers or bays, x-rays, radioisotopes, or radioactive fuel-reprocessing wastes. To be sure, expanded disciplines, new parameters, new unknowns in disease causation, and ingenious administrative tools will come into play. All these phenomena are familiar indices of an alert professional and lay society. The health worker, overwhelmed by new and assumed esoteric obligations, may profit by an objective look at these phenomena, to reassure himself that his historic position as umpire and arbiter between the perfectionist and the opportunist remains essentially the same. It is he who so often must separate the popular from the desirable, the critical from the dramatic, and the significant from the temporarily exciting. The problems in the physical factors of the environment have been elaborately spelled out in recent texts resulting from national or international conferences. They are available for general use and are noted in the References by name and origin. They provide an elaborate background for the comments in this paper.

## The Relative Significance of the Physical Factors

While we live in an age of hasty improvisation and equally rapid decision, we view with alarm change and its assumed consequences. This general feeling of crisis has penetrated into our discussions and assessments of our changing environment. The orthodox underpinnings of public health practice, namely, safe water and milk and their wide distribution, tend to be understressed in the rush to greener but less understood fields of endeavor. This is not because the general necessities have been met in our country, but because their actual contribution to disease has been almost completely eliminated by conscious design and management. Success has brought the penalty of official disinterest, even while overflowing septic tanks invade the country.

The corollary necessity for sewerage and sewage disposal is honored as much in the breach as in the actual illustrations. Here, too, universal acceptance of an idea is not paralleled by universal action. In 1960, in New York City, for example, approximately 60 to 65% of the Richmond Borough area and 40% of Queens Borough were not provided with sewers.[1] Yet, Sol Pincus, commenting on this scene, simply notes a situation not uncommon in many metropolitan areas of the United States.

Some gains have been made in recent years toward reducing the death rate from accidents in the United States, from 60 per 100,000 in 1950 to 52, in 1960. The situation is still, however, a

conspicuous blot upon the public health escutcheon. Last year, accidents, outranked only by the cardiovascular diseases and cancer, took a toll of some 93,000 lives. It is difficult to excuse the minimal attention to these coffins. They are responsible for at least one fourth of the total mortality in the most productive ages of 25 to 44. Not only are accidents a major killer, they are also a leading cause of illness and disability. The recent survey by the Public Health Service, for the year ended June, 1958, showed that approximately 47 million persons sustained injuries involving one or more days of restricted activity or medical attendance.

The motor vehicle accident death rate is a national disgrace, the responsibility for which must be shared by the public, highway designers, manufacturers, enforcement officers, and health workers. The last of these groups still views these undertaker certificates of death, great as they are in numbers, as problems somehow beyond professional concern. That their causes are baffling and their controls are difficult, may well be matched by the ignorance of some of the causes of the cardiovascular diseases. The comment is even more appropriate in the undetermined diseases resulting from atmospheric pollution or from the widespread uses of exotic chemicals in food, water, land, and air. Yet investigation, discussion, and even regulation proceed rapidly and with great public support in all these latter areas.

In atmospheric pollution, the relationship between health and comfort and concentration and nature of pollution is still less than satisfactorily demonstrable. Mounting evidence on causal relationships between disease and added constituents to the air is resulting from the Los Angeles studies. The more intensive recanvass of the events in the Meuse Valley, Donora, and London sheds additional light. Substantial as these advances in epidemiology have been, they do not provide the regulatory officer with the simple "vade-mecum" he so often desires. Development of public policy which will protect society while advancing industrial development places the health officer in his usual precarious position of true tight-rope walking.

The situation in the field of radiation, surprisingly enough, is less baffling. The nuclear fission industry has been more thoroughly scrutinized, analyzed, and supervised than any industrial process in history. Although the biologic effects of radiation are still imperfectly understood, rigid control of this industry's emissions and discharges has been unprecedently successful. Its continued supervision remains, of course, a necessity at various levels of government. Its rationale is much better understood than that of many of the other environmental hazards that concern us. In medical and some industrial applications of radiation, practices still leave something to be desired. Here too, however, real progress in control is evident, because of rapidly increasing understanding of the hazards, limitations, and appropriate supervision of procedures and facilities. Regulation of these positive values and negative disabilities, in general radiation practice, has already fallen quietly into the stream of administrative action in many states and local subdivisions. New knowledge will refine the tools of management and gradually extend the understanding of biologic effects. In the meantime, the health officer can proceed with both reasonable diligence and minimum fanfare in his allotted task of protecting man against this expanded radiation use.

Maintenance of an equilibrium between undue hazard and potential benefit to man has become more difficult than in the somewhat simpler tasks of 20 to 50 years ago. Then disease relationships were clearer, the differences between black and white sharper, and the corrective measures more obvious and perhaps even more economical. Standard methods of analysis and criteria for safety emerged reasonably early, even though then and now these latter rested upon the best circumstantial evidence at hand.

One major difference has emerged over the last two decades that was not dominant earlier. Many of the environmental factors we choose to control today have built-in beneficent values in parallel to their potential risks. This is peculiarly true, of course, of nuclear fission and radiation in general and the vast field of chemical-physical additives. The last of these, although not in my particular assignment, is an excellent illustration of a major cause of administrative schizophrenia. On the farm land, in orchards, with grazing herds, in kitchens at home and in restaurants, the multiplicity of additives looms large. A recent partial list, for food additives alone, covers well over 500 simple and complex natural and artificial chemicals. These must be extended to include still other materials used for other than food modification.

The dual values inherent in these products of our recent chemical industrial revolution pose clearly the health problem. They give rise to the contradictory attitudes so frequently apparent in speeches from the same department — or even from the same man! Essentially, the question is, is it true that man's activities in modern times have brought about greater environment changes "of more profound physiological significance than have all the generations of men heretofore"? The individual responsible for this fulsome charge then later hastens to point out that

greater and more comprehensive knowledge is required before the validity of the pronouncement may be established!

The conflict between value and disability is no more clearly apparent than in a recent speech by Dr. van Zile Hyde on "Pesticides — Vital to World Health." Here he states: "Intensive research efforts will find new products and uses in the pesticide field that I am sure will open new avenues to hope and health for mankind."[2] It is not surprising, of course, that from another arm of the same agency, a simultaneous broadside is fired against pesticides in general. The public has some legitimate cause for confusion, shared, no doubt, by many health workers.

## A Program for Balanced Action

The resolution of conflicting opinions and consequent administrative decisions cannot be accomplished by any magical sleight-of-hand. If these decisions stem from hasty semipolitical improvisation, they inevitably fall by their own weight, with considerable direct and indirect damage to society. Progress in control will depend upon militant and prompt research. In the areas we cover, such research is unlikely to produce its fruits with great speed. In the meantime, however, action cannot remain quiescent, but it must remain intelligent, reasonably well-founded and free from "brinkmanship." Some of the steps anterior to such decisive statesmanship in the public health field are here listed in hope that they may intrude in your discussions.

1. A restatement of the essential characteristics of the environmental problem, with a careful separation of the known from the unknown aspects of disease causation.

2. An appraisal by competent groups of the real and apparent health aspects of the various factors. An obvious spearhead in such an appraisal of multidiscipline character is the American Public Health Association. This agency has long experience in such methodology and should accept this task as promptly as possible.

3. The same group should initiate an intensive effort toward the development of suitable methods of analysis of exotic chemicals. The assignment is difficult, but mandatory even at this stage, if intelligent assessment of effects is to be made.

4. The design of criteria of health and safety also needs an early authoritative look by the APHA. Many new standards in the environmental field have appeared in the last five years. They have originated at all levels of government and are natural evidences of groping development and necessity. They are characterized by many inconsistencies, already being built into new laws and codes — a practice long familiar in the earlier history of plumbing and building codes. Errors of technology frozen into law are difficult to eliminate at a later date.

5. Controversial as they are, the toxicological effects of many substances finding their way into the environment must be assessed. Here again, group appraisal of findings must be provided on a continuing basis. Extrapolation of toxicologic animal findings to man is highly difficult, but invariably made. It would be wise to make these transfers through responsible group action — and here again the APHA should not wait too long to assume the prerogative.

6. Man survives in his environment by his natural and artificial adjustment to it. The continuing task of a worker in the environmental field has been to maintain a balance of equities, with the benefit of doubt normally given to the public. Such policy has never meant the discard of scientific evidence in favor of an "all or nothing" policy. Our waters, our land, our air will never be free of natural or artificial accretions. Their nature, their concentration, and their effect will require uninterrupted surveillance and appraisal. The program here outlined suggests specific routes that will develop bases for action. Without orderly machinery for evaluation, we shall perpetuate the battle between propaganda, preconception, and scientific verification. False concepts, no matter how assiduously pursued, are costly not only in money, but in wasted manpower and resources. The weeding out of unreliable findings and consequent actions is peculiarly the function of scientific groups. They do not consistently perform this duty now.

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# Social and Economic Factors Influencing Environment

"The provocative agent in this orthogenesis is *curiosity*, the faculty that anticipates needs, that solves problems before they become burning issues; that inspires research in pure science, and throws in for good measure practical applications, as gifts that are often only too truly gratuitous."
—A. J. Lotka, *Elements of Physical Biology*

"Prosperity is not without many fears and distastes; and adversity is not without comforts and hopes." —Francis Bacon, *Essays, Civil and Moral*, No. 5

I shall approach the subject of this paper from the standpoint of the economist, since I wish to touch upon both advantageous and disadvantageous changes in environment, or, put otherwise, upon both the benefit and the cost sides of environmental modification. I should like, also, to approach the subject ecologically, for, as James Malin's interpretation of grassland history exemplifies, man is subject as well as ruler of his physical environment, being compelled continually to reformulate much of his thinking and adjust his culture to this environment if he would also improve it.[1] However, I shall, for reasons of expositive convenience, merely treat technology and organization as interrelated factors influencing environment and population and helping to establish, if only temporarily, quasi-equilibrium among the components of these four ecological units.

## What Do We Mean By Environment?

I divide environment in two parts, that existing outside men considered as a group inhabiting a region or a country or the world; and that which, while describable as nonphysical and superorganic in character, exists outside individual man, or outside any small component of the larger group to which I have referred, but within mankind or (preferably) some segment of it. Environment in the first sense is essentially physical in character, while that in the second sense is essentially subjective and social.

Physical environment is not necessarily a constant, but is instead a slowly changing variable subject to still further deliberate or accidental modification at the hands of man. One may think of man as being pitted against nature, though with a much better chance now of taking at least some of the innings than was the case even two or three centuries ago. For, while man may be barred from modifying the stock of mass-energy, he can put energy to increasingly effective use and he can impose ever more varied forms upon matter.[2] Man's physical environment, therefore, consists of artifacts of his own making and of pieces of nature that have been made subservient to his wants, as well as that vast portion of nature which remains in a virtually pristine state and is as often opposed as congenial to his comfort. If we define the physical environment of any time and place, therefore, we must define it as a function both of man's past efforts and of nature and her forces.

The other part of the environment of man, or, more accurately, of the individual man, is the subjective world by which he is surrounded. It is the content of the minds of those composing the community by whose behavior his own material condition is largely determined. It consists primarily in the values by which the members of this community live and order their affairs and in the world of concepts by means of which they cope with environment, analyze problems, fashion institutional solutions and arrangements, and overreach the actual world in order to comprehend it better.

For purposes of the present discussion, the subjective, cultural environment must be distinguished sharply from the objective, physical environment, because man's ability to exploit the latter or surmount obstacles arising out of it depends almost entirely upon the content of this subjective environment. In an important sense, therefore, the extent to which the physical environment can be influenced in the long run is

governed by the degree to which the contents of men's minds can be changed. This depends in turn upon the extent to which obsolete notions can be washed out of men's brains and superior notions can be washed in, and upon the rate at which young and appropriately trained persons can be fed into a labor force as compared with the rate at which old and inappropriately trained persons can be removed from it by death and retirement.[3]

It is helpful, when thinking of environment in either sense, to think of it as a system, or as an element in a system that is in quasi-equilibrium or bound in time to adjust to quasi-equiiibrium conditions. Thus we may conceive of population, organization, technology, and environment as forming a quasi-equilibrium, as in traditional societies; or as constituting a displaced equilibrium when, as in our world, now far removed from equilibrium by the cumulative influence of "our scientific and industrial evolution," a necessary "period of adjustment to equilibrium conditions lies before us."[4] Also, we may conceive of man's superorganic environment of cultural variables as constituting a kind of quasi-integrated social system through which the consequences of changes of whatever origin may be traced. This approach has the merit of ruling out singular causes of change such as the climatic, of distinguishing between extra-system and intra-system changes, and of focusing attention upon the paramount importance of intra-system changes such as arise from strains and imbalances within a system and from continuous dialectical conflict between polar norms and between polar principles.[5] It has the merit also of making very questionable theories which anticipate that man will in time become encased in an unchanging routine of perfectly adjusted responses.[6]

## Indicators of Environmental Change

How to measure and indicate change is always something of a problem when that in which change takes place is quite heterogeneous or complex in organization. Both physical and subjective environments answer to this description. Simple, indirect indicators will be used, therefore, since fairly complete description of even physical environmental changes entails the use of more indicators than are readily handled in a short discussion. The indirect indicators I shall use are death rate, population growth and density, and income or output per head. These indicators are less satisfactory now than formerly, of course. Until recently, there usually was a fairly close connection between the state of health and the goodness of economic conditions and man's ability to control his environment, especially after the late 1700's and the bringing of pestilence under control. Similarly, the ratio of working life expectancy to total life expectancy did not vary much. However, this connection has been severed in the past two to three decades, though perhaps only temporarily, by modern preventive medicine and health measures; it is now possible to cut mortality greatly and sharply in high-mortality, backward lands, even in the absence of any notable economic improvement. Moreover, the decline in mortality has slowed remarkably in advanced countries though illness and disability rates, also good measure of man's ability to control environment, apparently have continued to fall.[7] Despite their emerging shortcomings, however, the indicators chosen do serve to disclose the explosive character of the improvement in man's ability to exploit and modify his environment as the foundation of economic life shifted from an organic base to inorganic and mental bases in the nineteenth century. Man's capacity to modify his environment has undergone its most revolutionary increase in the past 200 to 300 years, and more particularly in the past century, which has seen man successively invent the arts of invention and innovation and finally institutionalize them in self-sustaining and self-expanding social systems. There were, of course, critical cultural breakthroughs before that of modern times which were founded on the progressive development of science and technology: food production and village agriculture, a prerequisite to town life, came into being about 9,000 years ago, to be succeeded about 4,000 years later by an emerging syndrome of writing, metallurgy, urbanization, and rational political structure, to be followed two and one-half millenia later (i.e., about 600 B. C.) by the ascendancy of doctrinally and institutionally organized religions.[8]

Mortality did not begin to fall appreciably until the middle of the nineteenth century, though life expectancy at birth rose from the twenties in stone-age times and, despite intermittent setbacks, to the thirties in seventeenth-century Europe. At this time death was still "at the center of life, as the cemetery was at the center of the village."[9] However, the life-destroying upsurges of epidemic disease (especially plague) already had lost some of their power, as subsequently would louse-borne diseases and later the gastrointestinal diseases (e.g., cholera, typhoid fever) that initially accompanied urbanization, and later still tuberculosis and the communicable diseases of childhood. In consequence, life expectancy at birth began to rise at an increasing rate after the mid-nineteenth century, continuing so for some decades, until by the late 1950's

it was in the low seventies, around 35 to 40% below the human species' life span.[10] While this change worsened the age composition of populations, it helped set in motion a more than compensatory decline in gross reproduction. In Sweden, for example, this reduced crude natality from the upper 30's in the 1700's to around 15 during most of the past 35 years, though not before Sweden's population had risen from close to two million in the 1750's to a current seven and one-half million.[11] It is a decline in mortality similar to that experienced in Sweden that elevated Europe's annual rate of population growth from about ⅓% in 1650-1750 to ⅞% in 1850-1900; and it is the concentration into half a century or less of a decline in mortality that it took Sweden over a century to realize, unaccompanied by a decline in natality such as occurred in Sweden, that is elevating natural increase in underdeveloped countries from below 1% to 2 to 3% and higher. This growth not only is helping to modify man's physical environment, but also reflects forces similar to those which are changing this environment. Moreover, the capacity of much of man's habitat to sustain the great increases resulting in population density — more in the past 50 years than in the preceding 150 years — is attributable much more to improvement in man's technology and physical environment than to a nice adjustment of his numbers to the physical characteristics of this environment but with the technology unchanged. The next 50 years, however, will see more increase in population than has taken place since paleolithic times, with the result that in at least some parts of the world environment-changing forces will be hard put to meet the needs flowing from this growth.

Even more indicative of the operation of forces which have served also to modify man's physical environment is the increase in per capita income and output that has taken place, at least in the more developed parts of the world and often despite a decline in the past century of around 45% in the number of hours worked. Prior to the seventeenth century, output per head moved up very slowly, and even then with frequent interruption, in most parts of the world; and it has continued to do so in many parts of the world even in more recent times. It is, in fact, the snail-like pace of income movement that prompted most Utopians to emphasize redistribution instead of augmentation of income. In the eighteenth century, the rate of growth in per capita income appears to have risen in Western Europe; in any event, in England per capita income may have risen about 1% per year between the late 1700's and the eve of the industrial revolution. Between the 1860's or thereabouts and the decade preceding World War I, output per capita did not rise much faster than 1% per year, if that, in the United Kingdom, France, Italy, Russia, though at higher rates in Germany and Scandinavia, Northern America, and Japan. During the past 40 to 50 years, the rate of growth has been somewhat lower than formerly in some countries (e.g., the United Kingdom, France, and the United States), perhaps because of the impact of successive wars. In a number of backward countries, by contrast, the rate of growth has risen. Of import for the current discussion, however, is the implication of income data; namely, that man's capacity to modify and exploit his environment has been increasing for several centuries and is continuing to increase, though at rates varying widely in space and time.[12]

### Economic and Social Environment-Affecting Factors

Some arbitrariness always attends a distinction of environment-affecting factors into those that are economic and those that are social in character. Further arbitrariness would arise if the essentially political factors included under social were assigned to a supposedly political category. Within a short discussion, however, it is not possible to do more than confess to having been somewhat arbitrary.

The main economic factors affecting man's physical environment and (often) his subjective environment act on that environment more or less in combination. Analytically they may be grouped as follows:

*Capital and Capital Formation:* Capital, the product of both voluntary and involuntary saving, affects man's physical environment in several ways as it accumulates. It represents a growing addition to this environment, reflected in the fact that reproducible wealth is constituting an increasing fraction of all wealth in most if not all countries, while the rent imputable to land and natural resources is constituting a falling fraction of all income. It enables man to modify his environment by multiplying his original capacities and, in proportion as new capital incorporates new and superior ideas, to do many things he could not otherwise do at all. It facilitates the transformation of each generation of men into a generation technically and perhaps otherwise superior to its predecessor generation, in virtue of which transformation the labor force in turn is better able to transform the physical environment. It is responsible in part for the increase in output per manhour; thus, if capital per head increases by 1%, output per head under *ceteris paribus* conditions may increase by (say) 0.25 to 0.50%.

*Applied Technology:* In recent decades applied

technology has been responsible for the major share of that part of the increase in output per man hour — 50 to 85% — not attributable to increase in capital per man hour.[13] Furthermore, by increasing profits and income, it has greatly increased capital formation which depends primarily, in an immediate sense, upon the level of income, and secondarily upon interest rates.

*Economies of Scale and Agglomeration:* Within limits, as firms become larger and better distributed in space, net output per composite unit of input rises. Furthermore, more scope is allowed these forces, as a rule, when a state, together with its economy, is both large and well specialized and differentiated than when this is not the case. For when an economy is large, it is less subject to external constraints and therefore more amenable to maneuver in response to decisions taken within the country. In consequence, the country in question is better able to achieve a high degree of competition compatibly with extended division of labor.

*Flexibility of the Economy:* When an economy is exposed to dynamic forces of the sort described, it is essential that it remain flexible. It can best do this by decentralizing as much decision-making as possible, counting upon a free price system to supply producers and consumers with most of the information they require, and avoiding any concentration of economic power not compatible with economies of scale and agglomeration.

*Freedom of Enterprise:* Since innovation of invention and application of technology depend upon critical decision-makers who have the vision, foresight, and funds to anticipate and realize inventive opportunity, it is essential that entrepreneurs with a gift for creativeness or effective imitativeness be free to exercise this gift unhampered by restrictions and free of responsibility (which can be assumed by the state) for the unavoidable costs of technical progress.

*Bringing Resources into the Orbit of Use:* As has been noted, the basis of life has been greatly modified in the past 100 to 150 years through the founding of an increasing fraction of man's activities upon other than organic materials. This shift in base has entailed, or at least been made possible, by bringing more inorganic resources into the orbit of use; and it has been accompanied by a decline in the relative though not in the absolute importance of organic resources and the land whence they come. This shift has, however, imposed a cost. The environment whence these inorganic resources are drawn is finite; their original amount has been essentially fixed, with the result that in some instances, the stock of resources (e.g., potential water power, land surface) cannot be augmented and that in others (e.g., minerals) the stock is gradually being depleted by use.

Up to now, discovery, science, and molecular engineering have been averting the impact of shortages by bringing into the orbit of man's use many parts of his environment which he had not previously been able to use effectively. For example, the world's supply of fossil fuels will be used up in 100 to 200 years, but the development of fission material may enable man to draw on mineral fuel for perhaps another 10 centuries, after which he will have to draw on solar and other sources of energy, since availability of energy constitutes the key to much of what he can undertake. Parts of the world have always been short of water, and this shortage is now manifesting itself increasingly even in the United States; yet it will not be long before de-salinized sea water will become at least potentially available, though at higher than current costs, to many parts of the world which now face water shortages. Respecting various other scarce environmental elements, escape is being provided in that man's physical environment is coming to be looked upon as the repository of a chain of substitutes, various links in which can be made to take the place of links approaching exhaustion or available only at prohibitive costs. This process has been facilitated in some measure also by the fact that outlay upon inorganic raw materials forms a very small fraction of gross national product, and by the companion fact that the consumption of only some but not all of these raw materials keeps pace with the growth of gross national product.

Even with respect to use of space, the aggregate amount of which is fixed and most of which is situated in inaccessible or uncongenial parts of the world, some economy has been achieved up to now. Land input per unit of agricultural output has fallen in much of the world. Urbanization and metropolization have reduced the amount of living space utilized per capita, though this is being offset in part by the increasing demands made upon space by transport and other land uses unconnected with food production and residence. In the end, however, as numbers grow the shortage of space will be increasingly felt, since its total cannot be increased, since space in one place is only imperfectly substitutable for that in another, and since there is limit to the extent to which the input of space per unit of agricultural or residential output can be reduced. Furthermore, as income per head rises, space comes to be looked upon as one of the amenities, as is evidenced by increasing emphasis being placed upon recreation, much of which is space-oriented. In sum, therefore, while the usefulness

of man's aggregate physical environment has been steadily increased through the application of science, the substitution process involved runs into limitational factors of one sort or another, among which that of suitably situated space appears to be the most important.

The main environment-affecting social factors may be grouped as follows:

*A Strong State and a Well-Developed Apparatus of State:* Even though the apparatus of state is not used directly to modify or to conserve the physical environment, it must be well developed and manned by a competent and responsible bureaucracy in order that a milieu and climate can be maintained in which it is possible for the environment-modifying forces to function effectively. This bureaucracy is particularly needed when the state must assume great responsibilities as in times of crisis or when environment must be markedly changed.

*Support of Institutions That Generate Scientific Knowledge and Ever More Efficient Concepts,* together with support of initial efforts to utilize concepts of all sorts preparatory to their being set to work on a wider scale in the private sector or at least in sectors more immediately oriented to the wants of the underlying population: In view of the fact that applied technology is the principal source of man's power over nature, this support is the most important factor included in the present list.

*Educational Institutions:* Educational institutions are primarily responsible for the diffusion of basic scientific knowledge; economic enterprise plays a secondary role, though a quite important one in respect to on-the-job and refresher training. Much of what these institutions do relates merely to keeping a society and its economy intact, but a portion of it, and this is the portion critical for the growth of man's ability to exploit his environment, is strategic and forward-pressing in effect.

*Information:* In a sense, man's capacity for modifying his environment turns on his capacity to generate, accumulate, store, retrieve, and mobilize relevant information where needed. Responsibility for this function is partly vested in the state, in educational institutions, and in segments of industry. It is unlikely, however, that these institutions, at least as now organized, can perform this function adequately.

*Various Supplementary Institutional Arrangements:* Supplementary arrangements are indicated if men are to be animated to exploit their environments effectively and increase their capacity in this regard. Whatever their form, however, these arrangements must favor certain types of decisions rather than their contraries. Above all, they must rest assignments in the socioeconomic structure, together with the rewards paid out, upon the capacity of the individual to perform and achieve instead of upon his inherited (or similarly determined) status in society. It is essential also that judgment of achievement be guided by specific and universally applicable standards which hold for all. Illustrative is superiority of the nuclear to the extended family in respect to a society's capacity to do what contributes to change in environment.

*Freedom To Migrate and To Change Situations:* Mobility is essential, as has already been implied. It is worth noting separately, however, that when a population is highly mobile it becomes free of the worm-like view of the world found in isolated village communities. This change in view is essential to the generation of environment-changing power.

*Population-Growth Affecting Institutions:* Population growth, when numbers are too sparse, may increase the capacity of men to control their physical environments, since a minimal population is essential to make areas habitable (e.g., free them of tsetse fly) and a population of optimum size is essential if most effective use is to be made of the resources at a population's disposal. If, however, numbers are greater, too much capital is absorbed by population growth, the age composition is relatively unfavorable, and there are insufficient offsets to these disadvantages.

## Costs of Environmental Change

*Economic Entropy:* I referred earlier to what I am now calling economic entropy when I touched upon the use and the discovery of depletable natural resources. The quantity of utilizable matter actually or potentially present within a closed milieu, and hence the utility potentially present in it, is essentially fixed. Moreover, the extraction of utility from this utilizable matter involves change in its form, with the result that its potential utility is dissipated and that this matter becomes less utilizable or not utilizable at all. Use of this matter thus imposes a tax upon the utility potentially embodied therein, the utility potential declines, and what may be called economic entropy increases. A given portion of man's world may, of course, temporarily escape the effects of local economic entropy by drawing upon the utility potential of other portions; but his total economic world has little access to this sort of escape and then only insofar as he discovers ways of tapping sources external to this world.[14]

*Pollution of the Environment:* Exploitation of man's physical environment, in response to the growth of population and per capita consumption, may produce changes in this environment

which are adverse to his welfare as well as changes that are favorable thereto. Some of these changes are essentially accidental and unavoidable, and some are closely and obviously connected with his developing industrial civilization. Typical of the former are favorable and unfavorable ecological changes in forest and grassland consequent upon fire, and the disbalance of natural processes consequent upon adding billions of tons of carbon dioxide to the atmosphere each year.[15] Various effects are representative of the latter: excessive deforestation (together with its side effects), usually consequent upon population pressure, much as is decline in soil fertility in regions where too-intensive fallow farming is pursued[16]; the dislocation of original and "natural" drainage systems by water-wasting highway ditches and related artificial drainage ways[17]; the introduction of health-endangering and disease-generating chemicals and other pollutants into the air[18]; the contamination of food by chemicals employed in the growing and processing of food[19]; and the pollution of the nation's water supplies, with the result that in this country 20 years hence "more fresh water may be needed for diluting flows from waste treatment plants than for all the other uses put together."[20] By these and other forces, the eudaemonic quality of man's habitat is being progressively dissipated and support is given R. A. Piddington's succinct conclusion, "If present tendencies continue, the world will soon be inhabited by Man and his parasites. All other forms of life . . . will have disappeared into extinction."[21]

*Excessive Population Growth,* together with its concentration in densely packed urban centers, is rendering man's environment somewhat less favorable to his welfare than it would be if his numbers were fewer and growing very slowly; it is also subjecting his behavior to increasing constraint. This growth accentuates some of the forces making for increasing economic entropy and for pollution of the environment. It introduces various costs of which we tend to be unaware because they are represented as part of national income. It is steadily increasing the pressure of numbers upon those elements in man's habitat which are little or not at all susceptible of increase, and above all, man's pressure upon suitably situated space on and even above the earth's surface.[22] Should population growth persist, its costs will finally outweigh the improvements which man can still make in his environment. Long before then — now, in fact — population growth will be reducing man's freedom in uncompensated ways, since man's contacts (many of which eventuate in constriction of freedom) grow faster than does population, and since man's capacity to move freely finally declines as his numbers grow.

*Unfavorable Selection:* Genetic selection may already be less favorable (from man's point of view) among some forms of life inimical to man and it has been less favorable in human populations for some time. It is less favorable insofar as man's efforts to control his enemies, failing to result in the complete eradication of a set of species, eliminate less virulent types and thus make way for types highly or cumulatively resistant to man's efforts at eradication.[23] It may also be noted in passing that when emerging nationalism results in a multiplicity of small and weak states, organized disease controls of the sort established in much larger predecessor colonial areas are likely to become less effective, at least for a time.[24] Turning now to genetic selection in human communities, we find that "one effect of civilization is to increase mutation rates and hence the supply of harmful genes. A second effect is to decrease the rate of discrimination against such genes, and consequently the rate of their elimination from human populations by natural selection."[25] Or, as H. J. Muller points out, "environmentalist techniques alone" could not offset the ill effects of quite possible diminution in the capacity of selection to eliminate "individuals with excess detrimental genes"; they must be reinforced by giving suitable direction to genetic selection.[26] Such policy is all the more indicated as, in the absence of such intervention, conditions favorable to further evolution will be lacking.[27]

*Conflict:* Data relating to war suggest that as man's social and economic environment has improved, he has become more war-prone. The intensity of war has trended upward, though with some interruption, and the fraction of a nation's manpower (if not also of its mobile resources) devoted to war or to defense in times of peace has risen correspondingly.[28] For this movement various circumstances are responsible, many of which appear to be connected with changes in man's economic and social environment.[29] Whatever the specific causes of the trend, and even given that it can be arrested or reversed, some of the direct and indirect costs of actual and potential international conflict must be included among the costs whose amount has risen.

Progress in subjective culture serves to overcome or to alleviate some of the adverse effects of economic growth just described, and above all, effects associated with what I have called economic entropy and with increase in the scarcity of natural resources as numbers and per capita consumption increase. Strains may develop within a subjective cultural system for a variety of reasons. Here, however, I am con-

cerned primarily with strains which arise in part out of man's efforts to augment, differentiate, and elaborate his culture in order to make his physical environment ever more subservient to the satisfaction of his wants. If man would do this, he must continually swell the available pool of information, with the result that what anyone can know bears, as John Burnet observed four decades ago when the pool was much smaller than now, "a diminishing proportion to the mass."[30] No longer can man emulate Francis Bacon and take all knowledge for his province; at most he can somewhat decelerate the Malthusian tendency of his ignorance to draw ever farther ahead of the pool of knowledge in existence. Man's comparative ignorance may finally act as an insuperable drag on his progress, if inferior knowledge remains part of the growing pool on which each generation draws. Even if, despite the difficulties involved, obsolete knowledge is allowed to die and ever-improving electronic computers permit the professional man to draw almost instantaneously on a national central repository of up to date information relevant to his profession, he will still have an ever smaller command of the sum total of up to date information in the hands of mankind.[31]

What Platt has called "the knowledge explosion," is the product of specialization and of the fragmentation of knowledge and hence subject to costs attendant upon this process.[32] Platt notes that engineering alone embraces over 1,000 engineering specialties, and that the contributions being made to pure and applied science each year are distributed through about 100,000 periodicals and about 60,000 books. He notes also, when emphasizing the need "to eliminate old knowledge as rapidly as we create new knowledge," that "old knowledge never dies, although it may fade a bit"; our institutions of higher learning are instructing more people in archery each year than Henry V "was able to muster at Agincourt."[33] Moreover, despite occasional expressions of guarded optimism, it is more likely that specialization will increase than that it will diminish, what with doctoral degrees increasing something like 50 to 100% per decade.[34]

Specialization imposes costs, of which two could in time halt the extension of specialization and the progress of knowledge insofar as it rests upon specialization. There is the rising cost of coordination and the progressive narrowing of the specialist's perspective of his environment. As specialists increase in number, the task of coordination increases in greater measure, since the relations between specialists increase faster than their number.[35] Moreover, the burden of this task will increase more rapidly than the burden of the task of coordination of the activities of producers and consumers accomplished by a flexible price system and the information it continually supplies. For a price system, or its analog, probably can be counted upon to perform only a part of this specialist-coordinating role, with the remainder to be done by other and frequently inferior agencies.[36] The task of coordination may well be accentuated by the tendency of specialization to groove the specialist's mind and narrow his point of view, for a man's specialty tends to divorce his intellect from "the concrete contemplation of the complete facts," and to prompt him to treat superficially that which is not embraced by his specialty.[37] Should this particularizing of the intellect, together with the enfeebling of coordination, check or offset the extension of specialization, cultural progress might no longer function as an antidote to increasing entropy and resource scarcity. It has been suggested, even on other grounds, that highly focused specialization tends, under certain circumstances, to check more generalized progress.[38]

## Summary

I have described the factors which enable man to exploit and modify his environment, especially its physical component, and I have indicated the nature of the costs involved. I have treated this environment as essentially a source of advantages. I have neglected to emphasize, as the classical economists did, that environment is a major constraint on man's behavior, for since the environment is finite and capable of being supplemented and more effectively exploited only up to a point, it finally sets a limit to what men can do. It fixes outside limits to how many people can be supported and to the level at which they can be supported. Moreover, as this limit of population is approached, the average level of living is bound to decline, in part because multiplying people and then crowding them on environment beyond a point reduces their capacity to modify this environment effectively.

Even if growth in numbers is restrained, the range of choice open to man is limited. I have indicated many of the factors which increase man's power to exploit and modify his environment, and I have drawn attention to some of the costs involved. These costs are not necessarily entailed in invariant measure, however, given some rate of exploitation. If the flow of goods and services over the very long run is to be made as high as possible under given conditions, attention must continually be given to avoiding forms of environmental destruction and dissipation.

The numerous footnotes indicated by superscript numbers in the above text are available to a limited extent in complete copies of this address from Continued Education Service, School of Public Health, Ann Arbor, Michigan.

• THE HONORABLE JOHN E. FOGARTY
United States House of Representatives
From Rhode Island

## A Public View:

# MAN versus ENVIRONMENT

I am happy to find that your program committee has cast me in the role of the man on the street, Mr. Public. In this star-studded gathering of experts on every aspect of environment, I would be speechless if you had given me any other assignment. As it is, I feel something less than confident. It is no mean task to represent the 180 million people who make up that big American family who go by the name, Public, particularly on a subject as controversial as this one.

Talk about conflict of interest! In this field, everybody's interests seem to conflict and they fight like relatives over the will of a rich uncle. There's the conservationist branch of the family — listen to some of them and you'd think they want to turn the clock back to the days of Daniel Boone. There's the industrialist branch — sometimes you think their theme song is profits at any price, even health. Then, right in the middle, getting tomatoes from both sides, are the planners who want to fit us all into a neat little plan — whether we like it or not.

And while everyone is fighting with everyone else, the worst features of our modern environment — the pollution, the noise, the traffic — the whole miserable mess of urban sprawl, dirty water, stinking air — go right on getting worse.

You asked me for the public's view. Briefly, this is it: We want action.

We want action on air pollution. Put controls on those auto exhausts that are poisoning the air. Cut down the sulphur dioxide in city air. Studies by the Public Health Service in Nashville and elsewhere have shown a definite relationship between high levels of sulphur dioxide and asthmatic attacks.

We want action on water pollution. Pollution has already turned some of our rivers into sewers and is now getting serious even in the ocean. Several areas along the New York-New Jersey coast had to be closed to the shellfish industry just last month because of pollution. At the rate we are going, fish will be so rare we will have to visit an aquarium to see one. About 300 fishkills, destroying over six million fish, have been reported this past year, and a fishkill has to be serious to get reported at all.

We want something done about food poisoning. About a million people become acutely ill from food poisoning every year. That is the number who get the kind of food poisoning we understand; the kind that makes you violently ill in just a few hours. But nobody knows how many people are affected by the unknown kind of food poisoning — by the slow, insidious effect of the additives, the insecticides, and all the other chemicals that, one way or another, find their way into our food.

And no one is trying hard to find out. We still seem to be operating on the principle that what we don't know won't hurt us. In this radioactive age, that is a mighty dangerous principle. As I understand it, a person could be exposed to enough radiation to kill him without seeing, hearing, or feeling a thing. That is frightening

enough, but it is even more frightening to know that all these invisible radioactive and chemical pollutants are entering our environment all the time without anyone keeping the score so that we'll know when they all add up to too much for the human body to take.

Of course, the auto industry does not want to kill us off; it will, though, if traffic gets much worse, if more health and safety features aren't built into cars and highways, and if people don't learn how to use them safely. The chemical, petroleum, and other growing industries aren't going to kill us off either. We aren't even going to die from the unsightly mess the developers are making of our expanding urban areas. In other words, each contributor to our modern environment is careful to see that nothing he does causes obvious damage to health. But they don't get together. They don't get together with each other; they don't get together with you folks. That's why no one knows what all the new pollution adds up to. And that's why nobody will be ready and able to control it if it finally adds up to disability and even premature death for the people who live in it.

From where I sit, bombarded with mail from all kinds of special interest groups, it looks to me as if there is just one hope for getting people together on this problem. There is one area, and only one, where there is no conflict of interest and that area is health.

The industrialist is even more interested in health than he is in production and profits. The farmer hates illness even more than he hates insects.

The planners and the conservationists know that their dreams of ideal environments are never going to be realized, but if health is to be the gauge of how far technology shall be allowed to affect the environment, they'll go along. They know they have more to gain by fighting under the health banner than by going it alone.

In all the controversies about the Federal government's role in controlling water and air pollution, radiological and other environmental hazards, I've hewed to one line: keep the responsibility in the health field. That doesn't mean any lesser roles for the many agencies of Federal government that are and should continue to be increasingly active in environmental programs. But it does mean making health the paramount factor in determining control. It means that the Federal health agency — the Public Health Service .. has ultimate responsibility for whatever Federal action is necessary to control pollution and other health hazards.

If all of us can agree that health is the compelling reason for exercising control over our environment, it seems obvious that we will get more done and get it done faster than if we waste time, money, and talent in bickering over organizational structures.

In its years of work in this area, the Public Health Service has built up a nucleus staff of capable, dedicated men. From this nucleus can be developed the expanded programs the needs of the times demand.

At the blueprint stage now, for example, are plans to develop research activity in the environmental health field commensurate with the medical research activity that has stemmed from the National Institutes of Health.

What the National Institutes of Health has done to raise the whole scale of medical research in this nation, this new program can do for environmental research. To this audience, it would be presumptuous for me to discuss the urgent need for a stepped up research program or to point out that it will require Federal support. You know, as well or better than I, why we need more research and why the Federal government must help to support it. The only question is whether the development of a National Center is the best way to do it. Some scientists say that the same amount of money, if given to existing university and other research centers, would get things moving faster. They also claim it would glamorize the schools of engineering and thus lure more students into environmental health careers.

Certainly money needs to go into the existing research centers, just as the National Institutes of Health is putting funds into medical research centers. But if the National Institutes of Health experience is any guide, and I think it is, the total research effort will be sounder if there is also a strong Federally operated program. I don't think you can give sound priorities to projects, avoid gaps and duplications, or build up an effective, nationwide crash program without having some cohesive force at the center. In other words, if we have a race to win — and I think you'll all agree that we have — let's not pick an octopus with which to win it.

I believe we should have a National Center, comparable to the National Institutes of Health. In this Center we would have research workers, in air, water, chemicals, radiology, working together and — especially in relation to basic research — often on the same team. Scientists all over the country could use this central headquarters as a clearinghouse for information about work in their fields. It would be a training facility, a meeting facility, a resources facility; in brief, a central point of reference for the total national effort; something laymen as well as scientists could understand and be proud

of. I believe that if you ask your colleagues in the schools of medicine, they will tell you that, quite apart from the financial support they get from the National Institutes of Health, the very existence of an N.I.H. has changed the whole pace and scope of medical research in this country. I think that a National Environmental Health Center would do the same for you in your fields.

Such an Environmental Health Center is still just a gleam in the eye. No bricks and mortar have yet been laid. There is still time to give me and my colleagues in Congress your opinions. I'm especially interested in your views because I've been impressed with your balanced approach to this whole problem. I like your goal of going as fast and as far as we can in technological progress, but paralleling this progress with advances in health protection.

I also agree with you on the role of the Federal government in the control of the harmful environment. That role is and should be a limited one. States and communities have the primary responsibility for keeping their environs healthful.

The Federal government should do only those things which cannot be done or cannot be done adequately without Federal support. Research, on the scale required, must be Federally aided. Enforcement action to prevent pollution calls for Federal participation when jurisdictional boundaries preclude effective state or local action. Financial aid for developing statewide or regional plans, for river basin studies, and for other programming, that would probably never be done without the incentive of such aid, is also a justifiable field for Federal action. Demonstrations and other technical assistance are legitimate fields for Federal support, since the lessons learned can be applied to many communities.

The Public Health Service is already active in all these areas, but it can and will do more if we can get all the warring branches of the big family whom we call "the public" to unite under the banner of health. And if they unite, instead of pulling and tugging for their special interests, I think each branch will get most of what it wants.

Members of the planner branch aren't going to get their ideal metro's of course, because cities are made up of people and people never fit neatly into blueprinted plans. But, though short of their ideal, tomorrow's cities are going to carry the mark of the planners for the simple reason that people are willing to compromise on their personal plans when they realize their health is at stake.

The nature lovers, sportsmen, and other members of the conservation branch will also get a little less than they dream of because neither they nor the rest of us are willing to give up cars, planes, household appliances, and the other luxuries of modern life in exchange for virgin pure air and water. But with the growing realization of what wilderness vacations can do *for* our mental health and what smog covered cities can do *to* our physical health, the conservationists are going to find increasingly broad provisions made for bringing the environment much closer to purity than it is today.

And our cousins in industry — management and labor alike — know that money means little if health is lost.

The sponsors of this conference listed as one of their goals, "To consider principles and methods of practice which will encourage a maximum development of our environmental resources for society."

All of you at this conference can make a big start toward achieving that goal. You are the voice of science. You know what you are talking about. Most of the rest of us must take your word for it. Once it is clear that you have agreed to make optimum health your objective and that everything you advocate is related to this, the rest of us can support you.

Under the health banner, we can fight on the same side: scientist, industrialist, conservationist, planner, farmer, politician, all of us. Only then can we win battles against our real enemies —the hazards of our modern environment.

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# Environmental Needs for Industry

Let us get an early start on our subject by dropping back 7,000 years to approximately 5,000 B.C. Sometime within the next 1,000 years that followed, it is reported, glass of volcanic origin was in common use for weapons and tools. So we see that, in a sense, glass is a direct product of the interaction of nature's forces and resources.

The basic ingredients composing commercial glass may, then, be regarded as native to the surface of the earth. In fact, I have a sample of glass which illustrates the wide distribution of the major glass-making materials. It is made from a composition that duplicates the average analysis of the top 10 mile layer of the earth's crust. This corresponds to the black glass-like volcanic mineral fragments found naturally and known as obsidian. Obviously, to make a refined commercial article of glass of the correct melting range, we would use different proportions of ingredients.

Commercially, glass is made by using gas, another natural resource, to melt sand, lime, and soda ash (sodium carbonate) in a tank until it is a homogeneous liquid. From this point on, it is fabricated by either blowing, pressing, or drawing into thousands of articles that, as we shall see, serve man in many basic ways and influence his way of life and well-being.

A fortunate fact of our industry is that the principal raw materials required are in abundant supply and very widely distributed. Sand which comprises approximately 70% of the glass batch by weight is a common article available in many locations. A clear or flint glass requires a sand with a lower iron content than average. Heat is a vital element in producing glass. Roughly one third of a ton of coal, or its equivalent in gas, is required for melting a ton of glass. The matter of plant location is governed mainly by proximity to market and to source of raw materials from a freight standpoint. There is no foreseeable shortage of raw materials likely even when we limit our consideration to domestic sources only.

What are the ways in which glass has come to serve man and assume the important role it plays in our way of life? Safety, health, and medical uses for glass comprise one important area. Perhaps nearest at hand and first to be rated for their true value are the eyeglasses we wear and safety glasses. Rather important items. Next we think of laminated safety glass in our cars and luminous highway strips made of glass beads. Headlight lenses serve as no other substance has, temperature and the elements considered. The same can be said of the x-ray tube that provides the "inside" story so helpful to man's well-being. Glass electrical insulation seems commonplace enough until we find that a three horsepower motor will stand the overload of a five horsepower assignment without catching fire, overheating, or otherwise failing when it is most needed in the sanitary pumping system of a city. Special wall and skylight glasses in hospitals help to build health and brighten spirits of the ailing just as glass air filters alleviate the distress of allergy or asthma patients.

With reference to some adjuncts to comfort and daily living, glass provides the only suitable answer. What is more basic in our lives than a window or more natural than to stand before a mirror? Our whole civilization would suffer a setback if suddenly the light bulb or lamp chimney were eliminated. We have occasional reminders of this when the power goes off. Another article, the drinking glass, literally serves us from dawn to dusk. Special heat-absorbing and heat-resistance glasses are gaining in use.

We might continue into the structural and

decorative uses for glass such as boat bodies, glass block, wall panels, and building facings, or in the chemical glassware, glass pipe and tubing, microscopes and telescopes which are representative of scientific uses for glass. What would you consider using as a substitute for glass if you were packing an intravenous preparation? If you had to maintain the dimensional precision represented by the Mount Palamar 200" glass reflector, what alternate material could you use? Much could be written about the subject of noise abatement in the interest of man's welfare and nervous system as modern living continues to shorten the distance between the eardrum and the unwanted sound. The insulation of glass acoustical materials will markedly reduce many sound annoyances.

## Containers

There is no such thing as a "packaging industry" in the sense one would refer to the textile or the steel industry. The so-called packaging field is composed of a variety of products, some related, some unrelated, some competitive, some complementary and others noncompetitive. They consume a vast array of many different raw materials and produce an endless variety of shapes and sizes of containers which are put to innumerably different uses. They all, however, have at least one thing in common. All containers are intended to provide at least protection and preservation and an ease of handling of the commodities which they contain. Every item produced by American industry must be transported into the hands of the consumer before it can be considered to have an economic value. It is this transfer of the tempting, nutritious produce from the harvest, or of the priceless drug from the manufacturer to the market and home, without loss of quality or potency and without spoilage from contamination that gives rise to the principal service provided by containers. Also, in this supermarket wait-on-yourself era, the container must speak for itself by replacing the sales clerk, a function that is in addition to its traditional one.

Now how are these materials ultimately used? In 1959, industry data show there were over 115 billion paper boxes produced and consumed in the United States for an average of about 2,500 per family; there were 45 billion metal cans used or 990 per family. We also consumed 35 billion grocery bags and sacks, 22.5 billion glass containers, 24.8 billion cigarette packs, 9.2 billion beer cans, 2.1 billion pet food cans, 1.4 billion liquor bottles and 3 billion medicinal bottles.

It might be easier to comprehend the magnitude of these quantities if we use another means of illustration. The cellophane used in 1959 made into a strip a yard wide would reach from here to the moon 15 times. The aluminum foil used in the same year formed into a strip a yard wide would span the distance from Washington to Moscow 400 times. Glass containers produced in 1960 placed side by side would stretch around the world at the equator 25 times. (At least that gets us back to earth again.)

This revolution has resulted in an endless array of benefits to meet increasing public demand for convenience, labor savings, speed, improved quality, and the like. It is estimated that over 2,200 different items are packed in metal cans. With respect to cellophane, it is interesting to note that there are 105 different types of this material tailor-made for specific end uses reportedly encompassing over 100,000 different kinds and types of cellophane. Similarly, many thousands of different products go into glass containers, folding cartons, plastic containers, etc. If, as is reported, our population is to be doubled in the next 38.5 years, there certainly will be no letup in the demands for more in the way of innovations and improvements.

Today we already have "instantized" coffee, tea, potatoes, milk, orange juice, and other fruit juices. Hours formerly spent in the kitchen are now greatly reduced by the "heat and eat," "beat and bake," "slice and serve" products along with the ready-to-serve rolls, cakes, pies, cookies, etc., taken directly from the freezer. By means of a new freeze-drying process, wonderful results are being attained in the retention of original flavor of fruits as delicate as strawberries, to say nothing of T-bone steaks, shrimp, scallops, lobster, and the like. Who knows, we may even someday develop an appetizing TV dinner. I am reminded of one speaker at the recent MIT Centennial who had coined a term to describe the do-it-yourself movement. He called it "gratuitous artisanship."

The figures cited above are even more impressive in the light of historic growth which, measured in constant value dollars, has averaged a doubling in volume every 15 years for more than half a century. Roughly, and to the extent which an economy can support and enjoy the benefits of more and better convenience products, the usage of containers becomes a barometer of our standard of living. This we define as product availability plus capability of purchase.

This modern era in the United States dates from the beginning of the present century. The average American family (of which there were 16 million in 1900) had an annual income of slightly more than $3,000 in terms of 1959 purchasing power. It did most of its shopping at the corner grocery where butter came in tubs,

eggs in wooden crates, and crackers out of barrels. There were few brand names and mass advertising as we know it today did not exist. In 1900, about 1.1 billion glass containers were made by hand-blown methods. Half of these were used for drugs, another third were for liquors, beers, and beverages, and 10% were fruit jars for home canning.

Jumping to the thirties, despite the unfortunate circumstances of the great depression, increasing numbers of families enjoyed such comparative wonders as radios and washing machines. There were 23 million cars on the road and the supermarket experiment was underway. The Gerber Company had decided to make baby feeding their sole business. Yet no one gave much thought to deodorants or ball point pens.

By the 1950's such words as antibiotics, home permanent, instant coffee, and detergent were common terms and deodorants came in ball point pen type containers. In 1959, the average household had an income of $6,500 per year. It could aerosol an insect and watch a television commercial at the same time. While dishes were being cleaned in automatic dishwashers it went en masse in 60 million cars to do its shopping at self-service supermarkets and shopping centers. New record volumes were established for glass containers, metal cans, and gross national product.

All of the foregoing, of course, is merely by way of documenting the interrelationship which exists between the ingenuity and incentive of industry to create and progress on the one hand, and the interest and ability of the consumer to purchase better and cheaper products on the other. This freedom to produce when matched with a freedom of choice is not only vital to the progress of our economy. It is at the base of our free enterprise system which has long been noted for converting today's luxury into tomorrow's essential, along with greater satisfaction, a better life and a happier people as the goal.

Few worthwhile results are possible without consultation and collaboration with others. This applies to industry as well as to the individual. Industries can cooperate and, through private and government agencies, assure more intelligent use of our resources. After all, the future rests not on what we have (in the way of resources or facilities), but rather on what we do with what we have.

Over the years our company has participated in and benefited by cooperation with a number of valuable nonprofit agencies. Some of these, largely industry financed, have a primary function in their long-term contribution to man's health and welfare. An example is the Nutrition Foundation, Incorporated, about which you will hear more soon. Others we have supported include American Public Health Association, The National Sanitation Foundation, and the National Safety Council. In 1935 we initiated some work with the Industry Hygiene Association of Pittsburgh, (then known as the Air Hygiene Foundation), on sand as a raw material. We had heard of silicosis, and decided to learn something about it. To our amazement, we found much that was not known. The outcome was knowledge of the correct means to ward against silicosis. It was also interesting to learn that asbestos fiber, or glass fiber, when inhaled, does not cause a corresponding condition in the lungs.

Another example of cooperation with independent agencies is that set up 20 years ago by the paper manufacturers known as American Forest Products Industries Incorporated. Its purpose was the "multiple use of timber crop" for the additional benefits to man for conservation, recreation and wildlife activities.

Finally, the current classic case of collaboration between industry, private agencies, and the Federal Government is one we all know about. I refer to the Herculean task of reducing to practice the Food Additive Amendment of January, 1958. Since Hercules in person, Commissioner George Larrick, will address you, I shall go only so far as to say I am still wondering how he and his excellent staff have accomplished all that has been done. The answer, to be sure, is in the word cooperation.

Referring again to industry and its needs as we view the future, I would say that the greatest need is the answer to certain timely questions. Typical of these are:

1. Will the projected population increase actually materialize? There are some besides the Malthusians who think that it cannot.

2. Will the supply of water hold out without sizeable supplementary sources? Certainly practical ways to reuse water will become a major subject in the meantime.

3. How much more will the normal work week be reduced? Leisure time and its correct utilization grows as a basic problem.

4. How can the economic welfare of the western powers be continually augmented without inviting foreign competition at prices lower than our own?

5. Will the trend toward suburban living continue?

Whatever the answers are to these and other questions, speaking for the glass maker, the future was never brighter nor more challenging.

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# Needs in the Food Industries

Remarkable progress has been made through the past three decades in identifying all or nearly all of the essential nutrients. This qualitative accomplishment in identifying the chemical nature of each essential food ingredient has opened a new chapter in nutrition science. The new frontier is no less important than the earlier one, and follows logically: it is to make the science of nutrition essentially quantitative.

In other words, a diet that is rated qualitatively as "good" or "excellent" over a long stretch of time, must furnish about 50 nutrients that are quantitatively in reasonable balance with each other and with all of the other materials ingested. It is clear, already, that the actual quantities of different single nutrients may range from less than one milligram per day, as in the case of vitamin $B_{12}$, folic acid, cobalt, molybdenum, and selenium, to 2,000 times this quantity of some of the individual amino acids, or 4,000 times more of a single fatty acid. We might note, for comparison, that the carbohydrate intake, although not strictly essential, is very advantageous and is normally about 400,000 times greater than the intake of several of the essential minerals and vitamins.

The internal environment of food is obviously of primary interest to the consumer and to the nutrition scientist, because nourishment of the body is dependent on the availability of all of the essential nutrients as a first requirement. Secondly, many of the nonessential nutrients are desirable in forms and quantities that make foods attractive and safe, and that serve indirectly to sustain optimum health. Their presence can have a marked effect upon the functions and requirements of the nutrients that are essential, as illustrated in the value of flavors, colors, physical properties, relatively inert materials such as cellulose, nonessential amino acids, and optional energy sources such as starch and fats.

In all food raw materials, however, whether grown in primitive forests or on modern farms, there are always some materials present, such as arsenic, copper, or oxalic acid, that would involve obvious risks to health if consumed in excess quantities. Hence the food industry has a dual and rapidly increasing responsibility to safeguard the balanced content of all the nutrients as furnished in the general food supply, plus a similar regard for the environmental factors that might affect health or the esthetic values of food.

Identifying and getting some appraisal of the functional role of the individual nutrients has permitted our own generation, in many parts of the world, to achieve for the first time in human history a reasonable degree of year-round control over abundant, safe, and nutritionally adequate food supplies for large masses of population. Although these developments now permit providing generously for all age groups and all economic segments of the population, we cannot be complacent with this fortunate state of affairs, for many reasons. Many gaps still exist in our basic knowledge about the best use of foods to conserve health. This is particularly true of the use of food to defer or prevent many of the diseases that are associated with the upper age brackets. The biggest gains that we have made in conserving health by applications of food science have been:

1. In protecting food and water supplies from contamination with disease-producing microorganisms;

2. In developing a variety of low cost foods such as milk, meat, grains, fruits, and vegetables that permit good nutrition of infants and children; and

3. In making a safe, year-round food supply available to practically every city, village, and rural segment of the population.

This rapid development of a food industry, in turn, furnished an essential feature for a more stable and efficient agriculture, and it opened many areas that otherwise would have remained almost unproductive for lack of an economic market. Without the lifeblood thus

made possible by rapid improvements in agriculture, in food processing, and in food distribution to city and industrial areas, our own and other comparable countries could not have developed as they have, nor could they now maintain present standards of living.

The coordination of agriculture with the food industry not only permits our food supply to undergird our rising standards of living, but increasingly requires close collaboration with the chemical industry to obtain plant foods (fertilizers), crop protective agents, processing supplies, special nutrients, packaging materials, and constant surveillance of the health values of the final product. We are not only obligated to move ahead in this direction of increased chemical technology, but we have a clear responsibility to transmit such information to the underdeveloped areas of the world to accelerate their progress toward higher standards of living. Otherwise, explosive demands for food, health, education, and other resources to meet current and future needs will result in chaos.

With one half of the world's population still living in areas where there are not enough good quality protein foods to prevent severe deficiencies and high death rates among infants and small children, this is no time to be confused and misled about the necessity of adopting modern, safe, and efficient methods of food production and distribution. Those who become unreasonable or neurotic about organic farming and the safe use of chemicals are jeopardizing mankind's prospect of continued progress.

We can expect the great strides being made in the prevention and treatment of infectious diseases to continue. This prospect is particularly favored by the advancing knowledge of virus diseases and by continued success in such protective measures as immunization, modern sanitation, and improved chemotherapy.

New challenges arise continuously, however. Children are no longer dependent upon sunshine or seafoods to prevent rickets, when vitamin D is available. Of course, some sunshine will be welcome, nevertheless. Neither are they dependent on locally grown vegetables and fruits to prevent scurvy when oranges, grapefruit, green peppers, tomatoes, and frozen or canned juices are available throughout the year.

Another important feature of adjusting food practices to changing environments is with respect to exercise and caloric intake. More physical exercise than is now characteristic of modern life apparently is needed on physiological grounds alone, to develop and maintain bodies in a good state of health. In addition, our food patterns need to be adjusted in the direction of a higher relative content of proteins, minerals, and vitamins. These adjustments are simple to make, in terms of common foodstuffs, if one understands the nature of the problem. The old dictum, "He who wants to eat should first learn to work," still holds good. With a surplus of food available a new one is needed, "He who wants to be well should eat well." New techniques in agriculture and in food preparation create a constant need for voluntary and legally enforced surveillance. Risks of cumulative effects resulting from the use of new materials such as food additives, spray residues, and antibiotics have long been recognized, however, and the record in this respect is relatively good. By accomplishing three of our greatest gains in public health, (1) in the science of nutrition, (2) in preventive medicine, and (3) in the efficiency of making an excellent supply of foods available for nearly everyone, we have automatically introduced two new areas of intense research. First, we need to discover how best to protect those of our population who are advanced in age against the diseases that are of a chronic nature, unidentified in their early stages, but associated vaguely with premature aging — the onset of such diseases as atherosclerosis, coronary heart disease, cerebral strokes, kidney failure, obesity, arthritis, and many forms of liver disease. Let me emphasize that this situation is not a penalty for our progress to date, but instead, represents a new focal point for concentrating our resources for moving ahead. A second problem is to safeguard food and water supplies, and this must now include the atmosphere, so that added or residual chemical and biological materials will not introduce hazards to health that outweigh the related advantages.

We have an increasingly serious problem on our hands in providing for the interpretation of scientific work to the public. Unless the public has a reasonable degree of understanding of what scientists are doing, the reasons for doing it, and the tremendous good that will result to society from scientists' accomplishments, we cannot expect to have their full appreciation of research, education and improved practices. Confusion leads not only to much inactivity but to organized active opposition to improvements that are clearly in the public interest, as we have seen with reference to fluoridation of water supplies, where clearly needed, and in much recent confusion about the use of agricultural chemicals. The health professions have a greater responsibility than has been brought to bear in most communities. This is not a small problem or a short range objective. It is fundamental to continued progress.

Industry has a similar obligation to recognize the confusion that now exists and to be active

in the promotion of honest, unselfish, direct information that the public can understand.

There is more than a vacuum to deal with. Fringe groups with selfish and short range goals are active continuously in efforts to confuse and mislead the public. Unfortunately, many avenues remain open to them in the press and in other mass media because of the fetish of "interfering with the freedom of the press." It would help immensely if regulations and practices in advertising, and in radio and television scripts, required adherence to honesty in a manner comparable to current requirements in the labeling of foods and drugs. In this respect, we are at least a quarter of a century behind any reasonable rate of progress in developing standards.

Among the specific issues bearing on environmental health is the potential risk from radioactive materials accumulating in the atmosphere, in water supplies, and in foodstuffs. Obviously this is an area of great responsibility in relation to the risks of war and civil defense. However, it is also important in relation to the increasing use of atomic energy to furnish mechanical and electrical power in replacement of petroleum and coal. Two points will illustrate what may be ahead in this respect. Engineers are planning vigorously for the use of atomic energy in ocean liners, railroads, aeroplanes, and automobiles. Others are urging the utmost conservation of petroleum, natural gas, coal, and oil shale for essential chemical use instead of for fuel.

Unless the public develops confidence in the safeguards that need to be established, critically needed protective measures will be handicapped by lack of public support; or the public may go overboard through needless fear, and enact legislation that is in fact foolish and expensive.

In facing issues of this kind, it is fortunate that a corps of science writers is developing, with a deep sense of responsibility for their profession. They have a substantial knowledge of how to gather and interpret information in areas of science and health that is both significant and established on good authority.

One can readily imagine that the public will, in the near future have a part in deciding (1) where atomic power plants will be built; (2) how much radioactive waste they will tolerate in their water supplies; (3) how much atomic dust will be permitted to reach their community atmosphere, grain fields, and vegetable gardens from airplanes, trucks, tractors, and automobiles.

Reports have appeared frequently in the press dealing with the radioactive content of milk and other foods. Unfortunately, even extremely low values may sound formidable when expressed in small units of radiation that can be essentially insignificant. Again, it seems unfortunate that the emphasis too often is placed on milk. This practice results in part because collecting and testing milk samples is a matter of convenience for getting a good composite sample. There is doubt, however, whether milk should be singled out in a manner that makes the public unduly apprehensive of the safety of a product so critically needed in the food supply. For example, some of the differences reported on radiation risks have been of the same order as the difference in natural radiation intensity when a tenant moves a few floors higher in a building; or less than the difference when a family moves from a slum area to a residence on a nice suburban hill. Who would choose the slum on that basis?

The same principle applies with respect to residues that result from necessary protection of crops, forests, and livestock. Everyone agrees that the public should not be exposed to significant hazards from risks of this nature. There is general agreement also with the principle of requiring pretesting of new materials. However, unless the costs are within reason, and the significance of new practices are made clear to the public, needless and wasteful restrictions will be imposed and will stand in the way of social and economic progress. An illustration of the need for reason and scientific judgment instead of hysteria and fear in relation to modern agricultural and food practices is shown by a recent tendency to legislate in terms of so-called "zero" tolerance, or absolute prevention of any quantity of materials, under circumstances that do not involve significant risks.

The cranberry case became a good example of bad legislation. The law as amended and passed hurriedly did not recognize the fact that the quantity of a material in food is a fundamental factor in its biological effect. Attempts to correct the law have thus far failed, even though the absurdity of the legislation was pointed out by many scientists, including those representing the Food and Nutrition Board of the National Research Council and a special committee appointed by the President of the United States. Let me quote from the Report of the Panel on Food Additives of the President's Science Advisory Committee. "Americans today are better fed and in better health than at any time in history. This fortunate position derives from the rational exploitation of national resources through manifold applications of scientific research. The integrated contributions of the engineering, agricultural, and chemical sciences have resulted in increasing quantities of uniformly high-quality and pure foods which have contributed demonstrably to the physical well-being of the Nation." (May, 1960)

In December, 1960, a Special Committee on

Public Policy Regarding Agricultural Chemicals, appointed by the Governor of California and chaired by Chancellor of the University, Emil M. Mrak, reported on their extensive hearings in that state, from which the following quotation may be of interest: "The committee received substantial evidence from various authorities showing the importance and need for the use of agricultural chemicals in the production of an adequate food and fiber supply for our people. The great preponderance of evidence convince the committee that at this time our food supply is safe. The belief of some witnesses that the presence of any chemical residue in foods is deleterious was not substantiated."

A particularly unscientific approach has been taken in setting absolute zero tolerances for widely used stable substances in specific foods such as milk, instead of establishing a quantitative limit that would assure safety. Two fundamental errors in such absolute or "zero" rulings are, first, a failure to recognize that for any substance, there would be a minimum figure below which there would be no detectable biological significance. Furthermore, all materials can be injurious when quantities ingested are large enough. For example, the last eight elements to become classed as essential in animal and human nutrition had been studied biologically for several decades because they were injurious or poisonous in conventional quantities. Two of them, chromium and selenium, had been reported to be carcinogens. However, when the intakes were reduced to a definite range of lower values, they were found to be essential for complete health. Then at still lower values, they became insignificant. The eight elements are copper, manganese, zinc, cobalt, fluorine, molybdenum, selenium, and chromium.

The second error is that "zero" in terms of limit of identification." However, methods of composition can only mean, "below the present identification and measurement often change very greatly in sensitivity and accuracy. Hence what is legal or illegal one day, on the zero basis, can be reversed with any new issue of a journal that records a new range of analysis. One small bite of shrimp would have measurable quantities of the eight elements mentioned above, plus some arsenic, gold, lead, and nearly all the elements known to exist in the ocean. Yet in the quantities present, they harm neither the shrimp nor man.

Such widely used and stable materials as DDT are certain, in small quantities, to reach field crops, grazing pastures, and water supplies beyond their initial points of application. So long as the total quantities do not in fact jeopardize health, attempts to accomplish or enforce "zero" tolerances in such products as grain, meat, or milk become confusing and impractical. In contrast, quantitative margins of safety, expressed as legal tolerances, are a modern necessity.

## Summary

The entire food industry finds it necessary to move vigorously and continuously in the direction of safeguarding the quality of products that reach the consumer. Nutritional values are now checked regularly by nearly all large processors and they have a recognized status among distributors. In addition many companies cooperate in support of basic research that serves both the industry and the public.

The three areas of greatest nutritional progress at present are, first, to identify the functions of each ingredient in foods, because this is the fundamental basis for protection of health; second, to discover the quantities of each nutrient that will meet human requirements, because excesses and balances are now at least as important as deficiencies; and third, to identify the kind of food practices that will maintain the highest levels of human health and efficiency on a life span basis, with increased emphasis upon deferring or preventing the diseases that develop slowly and characterize an advancing age.

The requirements of modern agriculture, food processing, and food distribution necessitate very close cooperation with the chemical industry and with the respective government agencies responsible for surveillance. Studies by Federal and state governments, as well as by industry, show that our current food supply is relatively free from risks to health that might be imposed by the use of agricultural or food processing materials, and that the nutritive quality of food supplied to the public continues to be adequate to meet health requirements.

Nevertheless, environmental and cultural practices change steadily and therefore make mandatory on the part of industry and government agencies continuous research and education of the public, to permit both safety and progress.

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# The Environment and Public Health

The state health officer looks upon environmental health as one of his major problem areas. Everything he tries to do to prevent disease and disability sooner or later involves the environment. Where people live, work, and play, the air they breathe, the food they eat, the water they drink, all this is the environment. It encompasses every human activity day and night. We take our surroundings for granted, yet we should not forget them for even one minute in our planning for a better life.

In 1960, we reviewed the organization of the State Health Department in New York. Our first task was to try to predict what our major tasks would be. Environmental health was in the forefront of our concern. For the first time, we established a Division of Environmental Health as one of the five principal operating divisions of the Department of Health. There is no more emphatic way I can portray for you the importance we attach to environmental health in our population of 16,782,304 people. The old line responsibilities of sanitation are still with us — pure water, wholesome milk and milk products, clean and nutritious foods and decent places to eat them, sanitary refuse and garbage disposal, adequate housing, rodent and vermin control.

We need to be on guard as ever before, but we are increasing our effectiveness by bringing modern business methods into our control activities. We are bringing in ancillary personnel to save the talents of our highly-trained sanitary engineers for the tasks that require their special skills; we are decentralizing activities to the lowest echelon of government that is closest to the problems and the people, and we are reducing laboratory examinations to the barest minimum and thereby cutting control costs.

Sanitary engineeering is a quantitative field and the scientific method applies to it more than to any other practical activity in public health. Accordingly, environmental health experts of the sixties have an unequalled opportunity to use modern business methods in their lifesaving and disease preventing work. The mass of data handled by a department of any size is made to order for electronic record keeping, computing and activities control. The use of automation in laboratory procedures involving great numbers of samples of water and milk could increase efficiency and save professional personnel.

A combined attack might more quickly accomplish the task of carrying out research in public health practice in environmental health. The engineering schools, the schools of public health, and the larger health departments have unique parts to play. In the past, these groups have tended to go their independent ways, perhaps because of natural preoccupation, perhaps because of their differing responsibilities. The time has come for these groups to join forces, with the aid of our ablest experts in public administration, and to bring to environmental health activities the latest methods of big business. The techniques that bring profit to industry can increase community profits in environmental health.

What are the new areas that will challenge the expert in environmental health in the sixties? They are plainly marked for all to see — air and water pollution and radiological hazards. They overlap one another, dip into nonenvironmental areas, and have monumental importance in the future economic well-being of the state and nation.

## Water

The growth of our nation and its economic potential is limited absolutely by its water resources. We can no longer use our rivers, lakes, and streams as unrestricted dumps. Our population has grown too large, our industrial waste discharges too complex and our recreational needs too great to permit the uncontrolled flow of waste and contaminants into our waters. Waters must be re-used more often than ever before.

In 1959, the 15 million public water consumers of New York State used about 2¼ billion gallons of water a day. By 1975 we will have an estimated 17½ million public water users and they will need nearly 3¼ billion gallons a day. That comes to an extra billion gallons of water a day from public sources alone. In addition to keeping our current water sources clean for more frequent re-use, we will need new sources. To trap more runoff for water supply, recreation, irrigation, industry, power, and dilution pur-

poses we will have to locate and build new multi-purpose impounding reservoirs.

A Water Pollution Control Act was passed in New York State in 1949. It set forth both short and long range objectives. A Water Pollution Control Board was created by the Act; it has both permissive authority and mandatory duties to abate existing pollution and prevent new sources. The Board coordinates the work of the five departments of state government concerned with water resources. The main duty of the Board is to stimulate voluntary pollution abatement. When this does not work, the Board may employ its enforcement authority. This requires hearings for alleged polluters and enforcement of abatement orders issued.

The law in our state recognizes that no single standard of purity and quality can apply to all waters in the state or even to different segments of the same waters. Accordingly, the Board was made responsible for dividing various waters into appropriate classes of purity. To do this, the Board began in 1949 to supervise field surveys of all the water in the state. In these surveys the main criterion of purity is the uses to which the water has been put or may be put in the future. Under this system, there are seven classifications for fresh waters and four for salt waters. Once a body of water has been classified, discharges which fail to meet the standards constitute pollution and they become subject to abatement.

Since 1949, field surveys of waters have covered 50 drainage basins having an area of 44,970 square miles, or 90% of the state's water area. Comprehensive pollution abatement programs have been approved by the Board for 40% of the state water area.

Much headway has been achieved through the voluntary cooperation of municipalities and industries and without invoking any enforcement provisions of the Water Pollution Control Act. A good index of the pace of progress is money spent. In 1954, the sum of $8,780,000 was spent in New York State for sewerage projects, extensions, and industrial waste works. By 1959, the sum spent in the intervals for the same purposes came to $78,291,000.

Yet much remains to be done. Many communities have great difficulty finding the funds to abate their water pollution. It would appear that the State and Federal Government will need to share the cost if we are to accomplish the objective of clean, usable water in a reasonable period of time. Some long range planning is in order, state by state, to fit into the national goals.

This year in New York State we created a Water Resources Commission. Its purpose is to plan for the total future need for water in our state and to set policies that will ensure an adequate supply for all needed purposes. The six members of the Commission are the commissioners of the State Departments of Conservation, Agriculture and Markets, Health, and Commerce, the Attorney General, and the Superintendent of Public Works. For the first time, the total water needs of our state will be under one policy and rule making body. I think that this approach makes very good sense. Each department will administer a part of the over-all plan — the Health Department, water supply quality and water pollution control; the Conservation Department, the conservation and allocation of water; Public Works, flood control.

### Air Pollution

We have begun to find out some dismaying things about the health effects of polluted air. We know that cities with the heaviest air pollution tend to rank high both in death and incidence rates for a number of diseases. Heart disease and cancer, the ranking killers and disablers of our time, are on the list.

There are two points of fundamental importance in formulating a plan for the control of air pollution. Point one is that air pollution is no respecter of state, city, or county boundaries. Point two is that, just as in the use of water, almost everyone helps to pollute our air.

If you have already noted the similarity here with the conditions in water pollution, you can guess what approach I am about to recommend. Simply it is this: a concept of shared responsibility is just as necessary for air pollution control as it is for water pollution control.

On the technical side of the matter, several points must be noted. Many new substances will be added to our air environment during the 1960's by new industrial processes. There will be synthetic materials created by our fast developing nuclear technology and the development of high energy solid and liquid fuels. Exhausts from gasoline engines will become more numerous than in the past. Right now there are over 64 million vehicles registered in the nation.

While all this vast and variegated outpour of airborne contaminants is occurring, a scientific riddle of the first order is baffling those who do research in air pollution. The riddle is wrapped in the phrase, "synergistic reaction." A synergistic reaction can be described in rough terms: in the great test tube of the skies, a polluting substance we will call A mixes with other polluting substances we will call B and C. There can be more. In any event, under certain atmospheric conditions of heat, light, pressure, cosmic ray intensity and humidity, the deleterious

effects of these various pollutants have an additive effect. Their end product is a complex substance X. No one has bargained for substance X, but there it is and it doesn't happen to be very good for people. Many synergistic reactions are possible and with each there is a combined effect.

The problem of understanding the exact nature of synergistic reactions is enormous. Scientists are hard put first to know and then to duplicate the conditions under which several polluting substances combine to do their damage. And duplicate they must, under laboratory conditions, if they are to prove that a given set of pollutants produce a given synergistic effect in the sky. Sometimes they are not even sure which of the original pollutants are implicated.

But, suppose we take a case in which our scientists are able to identify a simple man-made contaminant in the sky. Suppose it is no trouble at all to trace this case to a metal fabricating plant in the south end of the city of Smudgeville. That metal fabricating plant employs 8,000 people and contributes about $15 million to the economy of Smudgeville. That same fabricating plant has 10 competitors throughout the nation. Each of these 11 metal fabricators is working hard for its share of the national business and to stay in the swim we all know that the cost-price ratio of any product sold in the open market must be roughly the same for each competitor. With our fabricating plant identified as the source of an undesirable pollutant, a representative of the local air pollution control authority goes to the owners of the fabricating plant and says: "Look, gentlemen, the effluent from your fabricating plant is bad for the health of the people in Smudgeville. You will have to find some way to reduce or eliminate it.

To this, the owner of the fabricating plant says: "All right. But to do as you ask we will have to conduct some extensive research and perhaps begin a pilot plant operation to test our methods. This will cost us money, a large amount, we're afraid. If we do this, the price of our product goes up $5 a ton and then we're out of business because none of our other 10 competitors charges nearly that much."

Now to this dilemma, you may suggest that the only answer is to have the other 10 competitors install the same type of equipment. But to do this poses a battery of potential problems.

Potential Problem Number One — Who foots the bill for research and development of the new equipment? This may be a major cost. If we insist that the first metal fabricator hit with a legal injunction is to assume the development cost then we penalize the first company to comply with abatement laws. This is certainly not much incentive for the fabricator, is it?

Potential Problem Number Two — Suppose that no air pollution control authority exists at some or all of the sites where the other metal fabricators are located? This is indeed a most likely circumstance today. Given such a condition, we then penalize any unlucky fabricator who is located where legal restraints exist.

Potential Problem Number Three — This one could be the toughest of all to resolve. You will recall that a moment ago I said that a synergistic reaction required an airborne mixture of certain chemicals under certain naturally occurring atmospheric conditions. Let us assume that the contaminant from our metal fabricating plant is involved in a synergistic reaction over Smudgeville. Having assumed this, is it not possible that the atmospheric conditions or the accompanying pollutants necessary to produce this result exist at one or two of the metal fabricating locales and not at the rest? If this turns out to be the case, then there is no need to require metal fabricators at some locales to eliminate or reduce their effluent to the extent that would be required at Smudgeville. Thus, a competitive imbalance would have to be imposed. This imbalance would benefit the economy of one city and damage the economy of another. Are the people of Smudgeville going to be willing to risk the loss of a plant that contributes $15 million to their pocketbooks in the interests of better health?

The point I make here is that there are no easy answers to the solution of the air pollution problem in each state or in our nation. From the examples I just posed for you that much is evident. I hope you will agree that a few starting points are quite important if we are to approach a solution.

The first of these is this: To balance soundly the needs of a healthy people and a healthy economy, we will need the most closely planned and integrated effort by the Federal Government, interstate bodies, state government, county, city, town, and village government. In short, governments at all levels must speak with one voice in air pollution control. That voice, I need hardly add, must be both firm and fair. It must be a voice that sees the total needs of a locality in terms of health, a stable economy, and sound growth.

The next starting point is this: The technical problems that attend air pollution abatement are extremely complex. What is more, it is a pointed fact that many such technical problems are as yet unsolved. A great deal more research is required. Highly skilled technical and professional personnel need to be trained. Equipment for

measuring many pollutants and for abating them is yet to be designed. And finally, not nearly enough is known about the specific effects of various pollutants upon human health. Until such direct relationships are known, the impetus to reduce pollution will continue to lag.

In 1957, an Air Pollution Control Law was passed in New York State. It established a public policy to maintain reasonable purity of the air. The law stated that air pollution is best controlled through public cooperation and that control regulations should be based on scientific knowledge. An Air Pollution Control Board was created by the Law. It was composed of five state department commissioners and four other members representing the medical and engineering professions, industry, and local government. The rule making and enforcement authority of this Board was not made effective for several years. This allowed the Board time to organize and train a staff, evaluate existing air pollution knowledge, give training and technical advice to localities, conduct research, and complete air pollution surveys.

Three statewide surveys have been made to assess New York's air pollution problem. These surveys indicated that only one of New York State's 40 communities with more than 25,000 population had a negligible air pollution problem. Reported sources of air pollution were varied. No one group of industries or citizens were mainly to blame. Economic losses throughout the state were estimated at $150 million a year.

The statewide surveys pinpointed nine areas in the state where pollution was found to be the greatest. Comprehensive area surveys of two of these areas have been completed and surveys have begun in two others. Meanwhile, our Air Pollution Control staff has been operating a 15-station air sampling network throughout the state and a 24-station pollen sampling network.

Our Air Pollution Control Board recently took its first formal step toward preventing new air pollution. The Board has proposed that industry must submit plans and specifications for any new process which might reasonably be expected to contribute to air contamination.

Thus, although our enabling law was passed four and one half years ago, we are just now in a position to begin carrying out our mandate to prevent new sources of pollution. Pollution that existed at the time the law was passed is still essentially uncontrolled.

The next step will be to classify air resources according to formulae based on their usage and the atmospheric conditions that prevail in each particular area. The eventual control pattern will be very much like that which we have used to abate water pollution.

My point in recounting New York's experience to you is to demonstrate that a control program does not just happen overnight. In our timetable to control air pollution, we have done well. Four and one half years is a short gestation period in which to define the specific problem in several areas, to train some specialists, to get the support of the public and industry, and to win modest budget commitments.

Most of our states have little or no air pollution control program as yet. This might not be so bad if they were able to short-cut their gestation period by borrowing upon the experience of states with more advanced programs. The truth is, however, that this cannot always be done. A polluted mass of air is a special phenomenon. The kind of pollution experienced in Rochester, New York, may not be much like the kind of pollution experienced in Rochester, Minnesota. Each state has to survey its own problem areas. And so the final point I would like you to consider is this: Even after a state has made up its mind to control air pollution, it takes quite a while before that determination can be translated into action.

With these several basic considerations fixed clearly in our minds, some effective planning is possible. To begin with, we need help from the Public Health Service if we are to get abatement programs off and running. The Public Health Service could contribute enormously by establishing regional reference laboratories. These laboratories would handle the more complex analytical problems for the regions they serve.

Leadership from the U. S. Public Health Service is vital. This organization requires ample funds and expert personnel to do the planning, research, and demonstrations needed, to give consultation, to assist in training professional workers to be employed by the states and local health departments. The Public Health Service could also loan consultants in air pollution control to those states that cannot afford such experts. Pilot control projects could be launched by the Service. Federal grants could be made to help laggard states begin their air pollution control work. Special funds for this could be earmarked under existing general health grants.

It will cost a lot of money to control air pollution. I have no idea how widely this basic fact is accepted, but this much is known: If we fail to control air pollution, the price of our failure in human misery and in dollars and cents will be far greater than the cost of control. This is perhaps the one point that is the most important of all to remember, so it bears repeating: In the long run, it will cost far more to put up with air pollution than to control it. As Descartes has wisely said, "The defects are always more toler-

able than the changes necessary for their removal."

### Radiological Health

And now for part three of our modern environmental health problems as viewed by state health department personnel: ionizing radiation. We are well into the atomic age now. The uses of atomic products are multiplying in medicine, in industry, and in agriculture. The loaded issue of nuclear weapons testing is far from resolution. Ionizing radiation poses special problems to those who would control its harmful effects. Radionuclides cannot be rendered harmless to man by any treatment process. The best that can be done with them is to use them with the utmost discretion and then ship any waste products to an isolated site where remaining power is spent harmlessly.

Another consideration involving ionizing radiation is that its effects upon the human body are cumulative and irreversible. No pills or panaceas will help the person who has been overexposed. Damage from radiation ranges from cancers to cataracts. When human reproductive cells are exposed, a penalty is imposed upon unborn generations in the form of harmful mutations.

Knowing this much about radiation, where do we stand today in terms of knowledge and in terms of control methods? First, in the matter of knowledge, let me quote this excerpt from a letter written in 1958 to the Surgeon General from Dr. Lauriston S. Taylor, chairman of the National Committee on Radiation Protection and Measurements: ". . . As you fully realize, our present philosophy on radiation protection is based on an absence of knowledge of low-level radiation effects. . . . The inability to observe low-level radiation effects does not mean that effects may not exist. As a result of this, the permissible dose levels may be unnecessarily low so that the Committee is unduly penalizing radiation usage in the service of man. On the contrary, the levels may not be low enough, in which case we are penalizing man."

Standards for protecting people against radiologic exposures all swing on one hinge. That hinge is our existing degree of knowledge about the effects of radium and x-rays upon human beings.

The National Committee on Radiation Protection plans to peg new external exposure limits to the known effects of background radiation.

In order to set knowledgeable external exposure limits, more needs to be known about three factors: (1) the effects of RA226 upon exposed population; (2) natural background radiation, its composition and effects upon living things, and (3) long-term effects of x-ray exposure.

The Public Health Service and some departments like the New York State Department of Health have begun to explore in these areas. They are now launched on cooperative ventures to study natural background radiation, primarily from the standpoint of its effects on living things. Studies of this nature are essential. We do not want, as Doctor Taylor says, to shortchange ourselves on the far-reaching benefits of radiation. On the other hand, we cannot and we must not risk penalizing man himself. Conditions in the world today force mankind to walk this tightrope; the atom is sorely needed — but so too is man.

So much for knowledge. Now where do we stand in control activity? Let me cite a few figures taken from a recent two year survey of radiological health programs in 33 states by Public Health Service personnel: of these 33 states, 21 did not have an enabling act for radiological health activities; 22 were without a comprehensive radiation code or regulations; 21 states did not require registration of radiation sources. In all of these states, the number of full-time radiological health personnel totaled only 51 and the number of people being trained for this work was just three. Fifteen of the states surveyed had no funds budgeted for radiological health work; another six had $5,000 or less a year.

I do not pretend that it is easy to get a state program in radiologic health under way. It takes a few years; you must crawl before you walk, and you must walk before you can run with such a program. The first regulatory action in New York State was adopted in 1953; it dealt with the indiscriminate use of shoefitting fluoroscopes. A comprehensive radiation code was enacted by the state in 1955. It required that radiation installations be registered and regularly inspected.

In getting a program under way, a first consideration is getting an adequate supply of technically competent personnel. Valuable help in training new personnel is available from the U. S. Public Health Service, the Atomic Energy Commission, and nearby universities. However, at probably no other time is the need for competent radiological health personnel more crucial than when a state is just making plans for a program. And it is at this stage that you do not have such personnel.

In New York we solved this problem by enlisting the help of expert consultants from industry, universities, and research centers. Much of the early planning was done by a Technical Advisory Committee. It was composed of representatives of the medical and dental societies, the Atomic Energy Commission, the Public

Health Service and independent experts on radiation.

The program outlined by this group sketched out three main and continuing tasks in radiologic health. Simply put, these were to (1) define the problem by studying ways in which radiation got to people and determine the relative importance of each exposure vector; (2) estimate the severity of each aspect of the problem. This involved measuring typical sources of population exposure to x-rays and other forms of radiation; it also meant collecting samples from various population exposure vectors and having them analyzed in laboratories; (3) control the problem. This final phase called for the development of inspection, sampling, and radioanalytical techniques to improve surveillance and ensure control of routine and emergency situations.

We found it necessary to train about 125 engineers and sanitarians to conduct routine field work. Meanwhile, we gave orientation briefings to public health physicians and program administrators. Today we have 19 full-time persons in our Radiologic Health Laboratory. Our budget permits us to have nine engineers in our Central Office. These nine are augmented by city and county personnel. The latter spend about eight man-years of service per year inspecting installations and advising users. In the summertime we hire high school teachers of physics, chemistry, and biology to serve as inspectors of x-ray equipment. They do a fine job and are happy to have the extra money.

Since half of the human exposure to ionizing radiation comes from practitioners of the healing arts, this has been a priority source for our staff. Our first field reports and studies told us that our number one activity would be to inspect and regulate x-ray units used in medical facilities. Our requirement that all radiation sources be registered has kept us up to date on the location, type of source, number of personnel, and other key data.

One of the commonly unmentioned sources of unnecessary radiation is from chiropractors. These persons are licensed practitioners of the healing arts in 46 of the 50 states; yet they indiscriminately apply x-rays to the gonads of a high percentage of persons who come to them for manipulations, if the experience in New York State is any criterion. I was personally involved in litigation with the organized chiropractors in New York State quite recently over just this issue. Chiropractors are not licensed in our state. Some revealing information came from chiropractors who testified at the trial.

Several chiropractors testified that there are at least 2,500 of their number active in New York State and that each sees, conservatively, about 100 new patients a year. They also admitted taking full spine x-ray examinations on 75% to 90% of these new patients; again conservatively, this would be about eight out of 10 new patients. This percent contrasts strikingly with the less than 10% taken by doctors of medicine and 15% by doctors of osteopathy.

These same chiropractors testified that most chiropractors take not only front views of the spine but also a side view and often times an oblique view. One chiropractor testified that he might take as many as 10 x-ray films at one time. Radiologists have testified that front view exposure of the lumbosacral area imparts one roentgen of radiation to the body in the gonadal area and that a lateral view can impart up to 10 roentgens, depending on body thickness.

Using these figures in a most conservative manner, we have estimated that chiropractors are exposing New York's people to 600,000 roentgens a year. I hardly think that this knowledgeable audience needs more than a reminder that this 600,000 roentgens comprises a totally needless population exposure coming as it does from unscientific sources. I might also point out that, since radiation exposure is both cumulative and irreversible, our population must live with a needless radiation exposure that has accumulated over the years and which now totals millions of roentgens of radiation. In the age of the atom, we can ill afford to squander the tolerable dose limits of individuals in this fashion. Our genetic heritage is too precious, our health too irreplaceable to permit the five roentgens of gonadal exposure in the first 30 years of life to be dissipated without benefit to the individual.

I sketched out New York's experience for you to give you an idea of what an individual state faces when it begins a radiologic health program. There are interstate considerations also involved. The National Advisory Committee on Radiation (NACOR) in its report to the Surgeon General in 1959 has already called attention to the absence of uniform regulations to cover all radiation sources. NACOR urged in that report that the Federal Government give technical and financial help to states to aid them in developing adequate radiological health programs.

The Public Health Service has made a substantial beginning in helping states to get radiological health programs under way. Yet more funds and personnel are needed to permit research upon which to base realistic standards for radiation protection. This money would also buy technical consultants to advise the states and it would accelerate the training of personnel. All of this is needed and soon; the states recognize this as an area where Federal leadership is essential and will be welcomed.

## General Engineering Services

Antibiotics, herbicides, and insecticides are finding their way into milk supplies, and fast new methods for processing milk are appearing. New hazards in our machine-driven and high-speed world have made accidents a leading cause of disability, death, and absentee-illness. New substances are being added to foods, clothing, and other materials with which human beings come into contact. Clean, habitable housing for everyone is still only a goal; about one third of the 48 million dwelling units in the United States are estimated to have major deficiencies. The growth, processing, and marketing of shellfish have public health significance because these foods can spread disease through contaminated waters. Insect and rodent control present problems to health workers in urban and rural areas. The inspection and licensing of slaughter houses is necessary to preserve the quality and safety of meat and meat products. Rabid animals still pose a threat to humans. Incinerators and sanitary land fills are a concern both to health and for esthetic reasons.

Amid this potpourri, one source of outstanding hazards is the accident. Accidents rank fourth as a cause of death in the United States and they are the leading cause of death between the ages of one to 36. The four leading accident sites are on the highway, in the home, at work, and at places of recreation. The leader, by far, is the accident involving the motor vehicle.

Engineering, education, and enforcement are not enough to prevent accidents. More must be learned about a fourth factor — the human factor. Our Driver Research Center in New York State has been conducting studies to learn more about the human factor in motor vehicle accidents. For example, the Center studied 50 fatal adult pedestrian accidents in Manhattan in New York City and found out some surprising facts.

For one thing, it was found that accidents rarely occurred where most people might expect them to occur — at major business and shopping areas. It was also found that residents of Manhattan were by far the usual victims. Nonresidents, even though they might be expected to be much less familiar with Manhattan's traffic conditions, were rarely involved. The study also showed that most of the Manhattanites were struck down within a few blocks of their own homes. The clear implication seems to be that a pedestrian's familiarity with a locale breeds a contempt which leads to disaster. The second lesson involved the victims themselves. Those killed could be divided into two groups — the elderly, sober person and the middle aged drunk. Obviously, advancing age and alcohol consumption sharply predispose towards pedestrian accidents.

I mentioned this study by our Driver Research Center to serve one point: we need more such studies, soundly prepared and carefully conducted, if we are to find out what specific human factors are involved in accidents of all types. Then, when we have solid information, we must find ways of getting the facts over to people in ways that will make them want to act. We have learned the hard way that it simply isn't enough to tell people that they increase their chances of getting lung cancer tenfold when they smoke over a pack of cigarettes a day. We have been saying this for over seven years and tobacco sales are booming as never before. We know now what the advertising industry has perhaps sensed for a long time — to communicate is not enough; you must also motivate.

## Summary

It is first of all important to realize that environmental health is a complex field. To solve its problems we will need the best of modern administrative methods and techniques. Public health's role in environmental health today divides into four parts — water, air, ionizing radiation, and general sanitation services. We need uniform laws and national leadership if we are to solve our problems in water pollution and air pollution. In radiological health, our immediate needs are for Federal assistance in the form of research, consultants, demonstration projects, and training programs. Strong emphasis needs to be placed upon the prevention of accidents by conducting more sound research in human factors and human motivation.

When we view the many facets of environmental health it is apparent that environmental health, human welfare, and the economy of a state are inseparable. The economic stability of our communities depends upon preserving an abundant supply of water and air, our two most precious natural resources. A sanitary environment is universally indispensable but especially in our urban areas for the well-being of their residents and the growth and development of homes, factories, and recreation centers.

For economic reasons alone there is no choice but to obtain and improve a healthy environment. The interdependence of our well-being, our economic status, and our environment demands that community planners give high priority to matching environmental health needs to all available resources. The correction of current deficiencies and the prevention of new ones go hand in hand to achieve maximum well-being for all people.

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# The Federal Government And Environmental Health

A couple of generations ago it was considered appropriate for a speaker to begin his remarks with a quotation from one of the more acceptable Victorian poets. Nowadays it is more fashionable to cite a statistic from last week's *Time Magazine* or, when a number of distinguished leaders from a given field are gathered, to quote from each other. I should like to revert to the old-fashioned gambit and open with a stanza from Edward FitzGerald's rendition in English of the Rubaiyat of Omar Khayyam:

"The moving finger writes, and having writ
Moves on, nor all your piety nor wit
Can lure it back to cancel half a line,
Nor all your tears wash out a word of it."

For a number of years now, the subject of environmental health has occasioned a great outpouring of piety and wit — generally, alas, more of the former than the latter — to which all of us in this room have contributed generously. Meanwhile the moving finger goes right on moving, and all our tears have had very little effect, except, perhaps, as one of those dilution factors the engineers keep talking about.

Seriously, I think that real progress is discernible as a result of the series of discussions of which this Congress is in many ways a culmination. For one thing, our view of environmental health has gained both breadth and depth. Not too long ago most of the thinking in this field was confined within the rather narrow boundaries of water and sewage disposal, milk and food sanitation, and a variety of related problems. Today, as the program for these sessions graphically demonstrates, we are ranging across a much broader panorama. We are recognizing the split atom, the split-level and the split personality as separate manifestations of Man's interrelations with the environment he creates, manipulates, and endures.

Moreover, although I am not generally a strong supporter of viewing-with-alarm as a mode of action, and despite the fact that in most of our meetings we are preaching to the saved, I think we can claim a number of impressive accomplishments in the relatively few years that we have been discussing environmental health as a fundamental problem of our society.

First, we have welded together a diversified and powerful corps of specialists attacking the problem with the varied tools of their respective sciences and technologies. We have come to know each other, to respect each other's strengths. We have learned to combine seemingly irrelevant fragments of knowledge into a reasonably integrated whole.

Second — partly as an outgrowth of this marshalling of scientific forces — we are moving gradually but I think steadily toward the revelation that the various political, social, and economic elements of our society should also be fighting together against a common enemy instead of skirmishing interminably among themselves. The old battle-lines still exist — between local and state governments, between either or both of these and the Federal establishment, between government at all levels and private industry. But, unless I am greatly deceived, these long-standing impediments to progress are wearing away. It is no longer possible, at a conference on some aspect of environmental health, to line up the participants as good guys and bad guys — depending, of course, on one's own point of view. The question at issue, with few exceptions, is no longer, "Does a pollution problem exist?" but rather, "How can we solve it most efficiently and economically?" This represents a tremendous gain.

Third — and this may be most significant of all — the people are becoming acutely and noisily aware that they need not live in polluted surroundings. In the field of air pollution, heavy black smoke that once symbolized prosperity now symbolizes a nuisance and a menace. As a result, it has virtually disappeared from some smoke-stacks, with no diminution of prosperity. Further, people are learning the more complicated lesson that freedom from smoke does not

necessarily mean freedom from pollution. As a result, the industries responsible for the presence of these invisible but all too palpable pollutants in the air will, sooner or later, drastically reduce or remove them. They will find that it is easier, and better business, to fight the problem than to fight the people. Similar tides of indignation are running in relation to water pollution — augmented by, but not wholly limited to, concern for health, or for recreational values, or for fish and wildlife. They are surging also in relation to slum housing and other manifestations of urban blight.

The levels of expectation of the American people are rising. They want to live and work and move in an environment that is pleasant and healthful. We may protest that their hopes are unrealistic, but in the long run we shall have to realize them. Every human advance began from an unrealistic hope.

My assignment is to examine the position of the Federal government in dealing with the health problems of the environment. In doing so I should like to employ a somewhat wider-angle lens than we are accustomed to using when we focus on those Federal activities which are obviously and specifically related to health. If we are serious about considering the total environment of Man, it behooves us to think in terms of total impact by the largest single enterprise in the country.

Over the past several years we have talked a great deal about complexities of interagency relationships when dealing with our water resources. Let us, therefore, consider for a few minutes some less familiar "conflicts of interest" among Federal agencies in connection with air pollution. Consider, for example, the airplane in air pollution. We are not concerned with the airplane as a polluter itself — although the traffic gets pretty thick over Willow Run at rush hours. But regulations designed to promote safety in aviation conflict sometimes with desirable practices in air pollution control. As you know, extremely high stacks are desirable in many cases to dilute pollution at ground level. Yet many plants that require such stacks for discharge of their effluents are in the approach path to major airports; in such cases, Federal regulations limit the height of stacks to eliminate a hazard to aircraft. Similarly, Federal regulations restrict the use of moored and fixed balloons and other means for making measurements in the air of the first — and most critical — mile above the earth, thereby making it quite difficult to obtain a great deal of badly needed information on the quality of that air.

A somewhat different example of intra-Federal conflict came up in a recent case heard before the United States Supreme Court. A natural gas pipe line operator sued the Federal Power Commission for the right to supply natural gas to a public utility in New York City for the generation of power in a steam power plant near the United Nations building. The utility desired to do so to minimize pollution of the UN site. The FPC had denied the application of the pipe line company on the grounds that use of this pipe-line capacity for power generation was less in the public interest than for other gas uses. The court found for the FPC, and thus denied the utility the right to use this means for decreasing objectionable air pollution.

All Federal agencies are under a presidential order to comply with local air pollution regulations. However, suppliers of the Federal government and purchasers of surplus Federal equipment are not under the same obligation of voluntary compliance. This leads to situations such as those involved in the scrapping of surplus Federal equipment, where the scrap metal dealer engages in pollution-producing practices, such as the open burning of vehicles, that are prohibited to the Federal agencies themselves.

Few people realize that the Federal government, through the Tennessee Valley Authority, operates some of the largest coal burning steam power plants in the country. As an agency dedicated to the distribution of low cost power, the obvious temptation exists to design plants with just enough air pollution control equipment to get by. Yet as a public agency, there is a responsibility to conform to a level of pollution control that will set an example for others to follow. To meet this challenge, the TVA employs one of the best air pollution research groups in the country to provide guidance in these matters.

Lastly, there is the role of the Federal government in establishing national policy on means of interstate transport of goods and people. To the extent that Federal policy favors truckers rather than railroads or vice versa, the intensity and location of vehicular pollution sources is heavily affected. Thus, a strengthening of the position of the railroads and an increase in railroad electrification would remove tons of pollution from the nation's air. Similarly, the routing of interstate highways, especially as they enter or bypass metropolitan areas, can have a profound effect on local pollution conditions.

Obviously these are only a few of many examples of the Federal impact on problems related to environmental health. Viewing the environment globally, every Federal installation affects both the literal and figurative climate of the community in which it is established. It may cause pollution. It almost undoubtedly causes congestion. It frequently places a heavy addition-

al burden on the health resources of the community, as well as on those in other fields of public endeavor. The net result is generally a random harvest of mixed blessings, ranging all the way from sanitation to sanity, and governed by various rules and regulations which may well be mutually contradictory.

I am not suggesting that these conditions exist as a result of cosmic malice, nor even as a result of general carelessness. It is easy to point out that the right hand knoweth not what the left hand doeth. But the Federal government has a very large number of hands indeed, and, as those of you who have worked in Washington know, it is sometimes quite difficult in the rush of business to find out what the people in the next corridor are doing, much less those in another building or another region.

Nevertheless, I think it is reasonable to expect the Federal government to increase its efforts to put its own house in order. If we are serious about environmental health, we must refrain from the sins against which we thunder.

Solid progress has been made in recent years. Most of you are familiar with the pattern of interagency cooperation which has evolved in many of our major river basins, whereby the various Federal agencies and the state and local units concerned, plus the interested residents of the region, meet in open hearings to speak their minds about proposed projects. This process is both healthy and prudent. It brings potential opposition into the open before the crisis point has been reached, and it carries safeguard against the half-cocked operation.

It is somewhat less well known that the presently vigorous and flourishing air pollution control program of the Public Health Service had its genesis in another form of interagency cooperation. Several years ago, the White House called together an interdepartmental committee composed of representatives of the several Federal agencies directly or tangentially interested in this suddenly significant national problem. The committee agreed that, since health appeared to be the most critical area of concern, the Public Health Service was the logical locus of primary responsibility. The main guidelines of the program were laid out by the committee and they have, with some necessary modifications, served us very well indeed. The program has retained its interagency flavor through the years. Meteorologists are assigned to the Public Health Service by the Weather Bureau. Our scientists and engineers work very closely with counterparts in the Bureau of Standards, the Bureau of Mines, and others. The Department of Agriculture furnishes personnel to man our investigations of pollution damage to vegetation. All this has been done quietly and unspectacularly, with a minimum of fanfare and mutual backthumping. Its most eloquent testimonial is that it works.

In the still newer and in some ways thornier field of radiological health, the Federal Radiation Council was set up in 1959, with the chairmanship vested in the Secretary of Health, Education, and Welfare, and with a Public Health Service physician serving as Executive Secretary. The existence of the Council has provided machinery for working through the many complicated dimensions of the emerging nuclear age and its impact on health. The Public Health Service, the Atomic Energy Commission, and the other agencies involved are developing more effective patterns of coordination of effort, and are benefitting mutually from each other's work.

The first recommendations of the Federal Radiation Council were approved by President Eisenhower a little more than a year ago. These provided a general philosophy of radiation protection to be used by all Federal agencies, and numerical Radiation Protection Guides — note the word "guide," not "standard" — for the whole body and certain organs of radiation workers and for whole-body exposure of individuals in the general population. The Working Group of the Council has been giving intensive study to such specific and complicated problems as the development of protection guides for workers in uranium mines, where the air is likely to contain concentrations of radioactive material far above any appropriate standard as compared with other occupational radiation exposures. The Working Group is also giving serious study to aerospace nuclear developments, major nuclear accidents, and disposal of radioactive wastes. Recommendations to the President will be forthcoming.

It seems to me that the existence and successful growth of the Federal Radiation Council, plus other interagency efforts, might well be paralleled in the field of chemical exposure to which all of us are giving so much thought and attention. I would even suggest that the need for a Federal Chemical Council is more immediately urgent today — as contrasted with tomorrow — than for the existing Radiation Council.

We are all concerned, and rightly, about the total body burden of chemicals reaching us through food, water, and air, at home, in transit, and at work, throughout the years of our lives. Yet we have not matched our administrative machinery to our concern. The Department of Agriculture certifies that a certain chemical kills bugs. That is its job, and there, officially, it stops. The Congress has directed the Food and Drug Administration to operate on the basis of a zero level of tolerance for any carcinogenic substance in foodstuffs. The celebrated Battle of the Cran-

berry Bogs a couple of years ago was fought on this line. Yet the FDA, through no fault of its own, has a large backlog of untested materials. Meanwhile it is not unlikely that, in the case of at least some potential carcinogens, people ingest greater quantities by drinking water from surface streams near the place where the chemical is used, or by breathing the air near the plant where it is produced, than they ever would acquire by eating normal amounts of the contaminated food product itself. This problem, related to agriculture, is one of several a Federal Chemical Council might tackle. Such a Council, with representation at a level high enough to assure incorporation of its findings into organizational policy, would fill another breach in our armament against our own creations.

Another way in which the Federal government can favorably affect the environmental health status of the nation is through its administration of grants-in-aid. As I have already mentioned in passing, the direction given to the nation's highway building and general transportation program could, and should, consider the impacts on health of our wholesale rearrangement of the American landscape. Closer to my own home in the Public Health Service, our grants programs for the construction of sewage treatment facilities and our development of air pollution control plans should encourage the practice of our endless preachments.

It is curious and rather sad that the water pollution control statutes under which we have been operating discourages, rather than encourages, coordinated planning for waste disposal on a metropolitan basis. Under the present law, each subdivision of a metropolis must use its funds separately; they are effectively prevented from putting the pieces together into a sensible metropolitan package. Legislation before the Congress will change this situation. On a still more positive note, a plan is being developed for survey and demonstration grants in air pollution that will grant a more liberal allowance — in effect, a stimulatory bonus — to subdivisions that combine their efforts for metropolis-wide planning.

The Federal government, like the National Sanitation Foundation, is in an unusually strategic position for calling together representatives of the many governmental and nongovernmental entities interested in various environmental health fields for purposes of long range planning in the national interest. National conferences, such as those on air pollution in 1958 and water pollution in 1960, are one important method. But, as everyone freely and accurately predicted at the time, the really significant question is what happens after the conference. In the case of last December's water conference, it is too early to tell. The after-effects of the air conference, however, have been in my judgment both meaningful and dramatic. As most of you know, a broadly representative group of key people representing Federal, state and local governments, private industry, research organizations, and various professional and citizens' groups have drafted a set of national goals to which all have publicly subscribed. These goals include time schedules and even a reasonable distribution of costs. Both the product and the process involved here demonstrate what can be done when the artificial barriers are broken down.

I have outlined broadly three avenues by which the Federal government can help to shape the environment to biological reality — by putting its own house in order through closer coordination of its many enterprises, by intelligent guidance through the grants-in-aid, and by exercising its logical function as a national point of assembly for long-range planning. A fourth — and I place it fourth not in priority but only because it is more self-evident than the others — is the conduct and support of research.

Research, like every other phase of the general attack on environmental health hazards, has to be a partnership proposition. It is not a Federal "exclusive." But the depth and breadth of the problems involved, their occurrence in more or less similar forms in many states and localities, and the enormous costs involved all conspire to place the major responsibility for leadership on the Federal establishment. The experience of the Los Angeles County Air Pollution Control District, to cite one local agency which has undertaken Herculean labors, highlights the necessity for Federal involvement on a large scale.

A couple of examples of recent research projects will serve to illustrate the complexity of the phenomena we are seeking to elucidate. It has been shown that up to a 100% kill of bacteria may be achieved through exposure to auto exhaust fumes — in concentrations commonly found in community atmosphere — when the fumes are subjected to artificial solar radiation. If the sunlight effect is removed, there is no kill. Moreover, if the particulate matter is filtered out of the exhaust, no kill results. The bactericidal effect seems to depend upon both particulate and gaseous pollutants combined with solar radiation. A fascinating experiment was reported by Dr. Paul Kotin at the cancer meetings in Atlantic City in April. A group of 100 mice raised in clean air contracted no lung cancers. A second group of 100 exposed to simulated smog were also cancer-free. A third group given virus influenza produced eight lung cancers out of 100. But a fourth group, exposed to both virus in-

fluenza and synthetic smog, showed 30 spreading lung cancers.

In sum, we have entered a period in the health sciences when the familiar concept of one-disease-one-cause may no longer apply. The chronic diseases are leading us into the unfamiliar search for multiple causes, for combinations of biological, chemical, and physical factors which produce results no one of them can produce alone. The potential causative or aggravating agents in our environment are many, and their possible combinations approach infinity. Unless we are to give the whole thing up as a bad job, an alternative no one would accept, we must conceive our environmental health research effort on a grand scale.

This is precisely what we in the Public Health Service are seeking to do. All of you are aware, I'm sure, of the greatly increased support we have received from the Congress in recent years for research in air pollution, radiological health, and other components of our environmental program. We have, as you know, regrouped our forces to bring our environmental health operations together in a mutually-reinforcing unit that will, if present plans are carried through, become a new Bureau of Environmental Health parallel to the three existing Bureaus that make up the Service.

The brightest gleam in our eye at present, on which more news will be forthcoming in the future, is the development of a new Environmental Health Center designed to accommodate a full-scale, integrated attack on the problems with which we are mutually concerned. If and when plans presently on the drawing-boards become reality, the new Center will give the nation a resource measured to the scale of our problems.

This new Environmental Health Center will shift the emphasis but by no means diminish the importance of the Sanitary Engineering Center at Cincinnati. As presently envisioned, the SEC will be a major field center bringing services from the several environmental programs closer to the people in a major geographic area. In addition, increasingly concentrated attention will be given to problems of water and waste treatment, because of the specially designed pilot plant and other facilities. Because of the nature of environmental health problems, and their intimate relationship with specific local environments, we shall continue to need field stations in various parts of the country.

I have not engaged in a lengthy recital of Public Health Service programs, achievements and plans in environmental health, not because I am not proud of them, but rather because they constitute, for this audience, an oft-told tale. Nor have I, in delineating broad general areas of Federal responsibility, touched upon the subject of enforcement. Most of you are acquainted, I think, with the limited Federal enforcement powers authorized by the Congress in our water pollution statutes. I might mention, in passing, that enforcement procedures have been initiated affecting 131 cities and 220 industries, intended to clean up 4,000 miles of interstate streams and their tributaries. We were most pleased with the results of the most recent referendum in St. Joseph, Missouri, where the citizens voted in favor of waste treatment after rejecting similar propositions four previous times. For those who consider growth of Federal enforcement powers a threat and a menace, there is one excellent way to prevent it. That is to do a thorough and competent job, state by state, locality by locality, industry by industry. Unless I seriously misread the administrative history of public health, the Federal government does not arbitrarily poach on others' preserves until the preserves are in a pretty serious state of disrepair — until, to put it another way, the progress being made on a given problem by those directly responsible falls far below the levels of reasonable expectation.

About a year ago, Walter Lippman wrote a column which I think a great many of us might well use as a text to live by. He said:

"There are some who will say that we cannot meet all our public needs without abandoning the freedom of our society. There are others of us who say that we must meet these needs, that we can meet them without sacrificing our liberty, and, indeed, that by meeting them we shall strengthen our liberty. This is the central issue of our time, and no one who is interested in public life can ignore it."

Then, after a careful analysis of the dimensions of such problems as scientific research, better public schools, more adequate hospitals and public health sevices, public works, water supply and sewage disposal, and the like as compared with our anticipated economic growth, Mr. Lippman concluded:

"When we look at this problem quantitatively, comparing our growing needs with what can be our economic growth, we may conclude that our tasks are big, which makes them interesting, but that they are quite within our capacity."

I'm with Mr. Lippman. Our tasks in environmental health are certainly big enough to be interesting. They seem hopeless only if we consider the problems broadly and our resources narrowly. The scientific, technologic, economic, and social forces now rallying to the cause of environmental health, of which the Federal government is but one important part, are perfectly capable of rescuing Man from the unfortunate effects of his multifold creations.

• THE HONORABLE GEORGE P. LARRICK, D. Sc.
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Washington, D. C.

# FOOD and DRUGS

Science and technology have increased man's expected lifespan, have provided goods and services undreamed of a few decades ago, and have presented the possibility of abundance and leisure for great masses of people. However, there are accompanying hazards. Today's drugs are much more potent and of greater specificity than those of other earlier times. Unavoidably, this presents a greater likelihood of harmful side effects if the drugs are misused or if their purity, potency, and composition vary from appropriate standards.

In the area of foods, the scientific developments of recent years have had similar applications. A host of organic chemicals developed during and since World War II, beginning with DDT, have been advocated for use — and have in fact been used — in ways that result in residues in food. New pesticides are contantly being produced that may result in residues on our crops.

A myriad of new products have found usefulness as emulsifiers, preservatives, surfactants, etc., as direct additives to foods. New processes and new packages may inadvertently add chemicals of various kinds as contaminants of food. This atomic age has produced not only the atomic bomb, but industrial uses of atomic energy such as atomic power. I shall endeavor to outline a few examples of the scientific investigations and research programs that the Food and Drug Administration believes essential to enable adequate and appropriate administration of the Federal Food, Drug, and Cosmetic Act. However, I should first like to comment briefly on the obligation of industry as we see it.

When a food producer goes into business, he assumes an obligation to produce wholesome food. Today, when each of us depends on others for food, this obligation is even more important than it was a few generations ago. It would exist in the absence of the law. In our society it is supported by legal sanctions contained in the Federal Food, Drug, and Cosmetic Act.

We in government have an obligation to see that consumers get the pure food the law says they should have. To help industry do its part we have a strong educational program designed to acquaint manufacturers with the requirements of the law. Where the educational effort proves inadequate, of course, we apply the formal sanctions of the law.

In addition, we have research and investigational programs in areas that are often inadequately or seldom covered by the industry. Technical administrative decisions can only be made from a sound scientific foundation. Our research programs provide the scientific background necessary to understand the pharmacological, chemical, bacteriological, and other scientific problems attendant on modern food and drug production.

Under authority of the Pesticide Chemicals Amendment of 1954, we establish safe tolerances for residues of pesticide chemicals that may legally remain on crops. Based upon toxicity and residue data, we have esablished safe levels for over 100 pesticide chemicals on more than 2,000 crops. However, these tolerances must be reevaluated as new scientific evidence is developed which bears on them. We are constantly on the alert for new facts that may reveal inadequacies in the data originally considered.

A specific example of this readily comes to mind from our work on malathion and EPN, two organic phosphate pesticides for which tolerances had been granted. Malathion is relatively less toxic to mammals because it is detoxified very rapidly by an esterase enzyme system, than it is to insects, where no such system exists. However, this esterase enzyme is extremely sensitive to very small quantities of a number of other organic phosphate chemicals. EPN is such a chemical. When EPN is administered to a

warm blooded animal just prior to or at the same time as malathion, it inhibits detoxification of malathion, thus allowing this chemical to exert a greater than normal toxic effect in the body. In other words, in the mammal EPN may be thought of as potentiating the toxicity of malathion.

One of our pharmacologists discovered this potentiation when he conducted some experiments to determine why malathion was relatively so much less toxic to mammals than other compounds in this class. When he discovered the effect, we promptly conducted other tests to determine whether the existing tolerances for malathion were safe. Fortunately, the margin of safety employed in establishing the original malathion tolerance was sufficiently great, and the tolerances were adequate to cover the potentiation.

As a result of this experience, however, we have, since 1956, required more data to support proposals for tolerances on new chemicals of this class (and there have been several). The petition for a tolerance must now include, in addition to the usual toxicity data on the chemical itself, data as to possible potentiation with all other cholinesterase inhibitors for which tolerances have been established.

Our scientists, in cooperation with the Department of Agriculture, have conducted some significant experiments to determine the fate of certain pesticide chemicals when fed to cows. They have shown that some of the chlorinated compounds accumulate in the meat and milk from even very minute levels in the feed; for others there are "threshold" levels in the feed below which residues do not deposit in the animal tissues. They have found that certain of the organic phosphates, such as parathion, are destroyed in the bovine metabolism and do not place residues in the meat or milk. This has been confirmed by experiments showing that the compounds are readily destroyed when added to bovine rumen fluid.

We conduct investigations such as these to help our scientists determine whether tolerance levels requested by manufacturers are in the public interest. Our evaluations must go further than a rapid review of the work done by the manufacturer.

Analytical methods have, necessarily, become more and more complex as more chemicals are used. If there were only one insecticide containing organic chloride, a simple and rapid test for chlorinated hydrocarbons would suffice. Similarly, if there were only one organic phosphate insecticide, the analytical problems would be minimized. However, as the number and types of insecticides have grown, it has been necessary to devise more and more selective and specific analytical procedures. The chemical as well as the pharmacological interrelationships have become more complex.

The Food Additives Amendment of 1958 and the Color Additive Amendments of 1960 present new problems and new responsibilities to our scientific staff. The traditional methods of testing a new chemical to determine whether it would be safe in food, can and should be improved. We are trying to improve them. Among other things we are exploring applications of tissue culture procedures, microbiological applications, and biochemical and metabolism studies.

Better methods are urgently needed for determining the safety of chemicals that can produce cancers when fed to test animals. The law requires us to forbid the use in food of a chemical that produces cancer in test animals. This is because responsible scientists say they do not know how to determine what quantity of a substance that produces cancer when fed to test animals would be required to produce cancer when fed to man. In view of the great lack of knowledge in this area, we must oppose efforts to change the food laws to allow small amounts of cancer producers to be placed in man's food.

When it became apparent a few years ago that the atmospheric testing of nuclear weapons was contributing potentially harmful radioactive substances to the environment, the Food and Drug Administration embarked on a broad surveillance program designed to discover how much of this total radioactivity was getting into the food chain.

First, we needed base-line data on the naturally occurring or background radioactivity. From various sources we obtained samples of foods produced prior to 1945; samples held in storage in our laboratories, samples made available to us by manufacturers and housewives in response to our public call for such materials, and a considerable number of samples from caches established in the region of the South Pole Byrd expeditions. The base-line counts from the pre-1945 samples enabled some evaluation of the extent of increase in radioactivity from man-made sources.

Our surveillance sampling of foods and testing for radioactivity continues. Over 7,000 samples of 50 different foods have been examined for total beta count. Many have been examined for Strontium-90 and Cesium-137. Methods are difficult and lengthy. Here are new and important areas for fruitful research.

To date, our surveillance has shown, among other things, that the peak of Strontium-90 contamination in foods may have been reached.

However, the eventual decrease of contamination following the moratorium on weapons test-

ing does not spell reduced surveillance activities. Industrial and military applications of nuclear energy are rapidly expanding and increasing the potential for accidents, such as the type that occurred in England. Such events would be expected to produce severe local situations that could require vigorous control action. Under normal operations, radioactive byproducts of industrial reactors are carefully controlled and the contribution to the environment as of now is very small.

We must, however, accept the possibility that in the near future the sheer volume and additive effect of many new applications, each in itself carefully controlled, will induce a measurable increase of radioactivity in the environment.

One of the most interesting developments of the frozen food industry — and perhaps an expected outgrowth, considering the eager acceptance of such convenience foods — has been the emergence of frozen precooked foods requiring the consumer to do little more than heat and serve complete meals from packages stored in a freezer. This has further shifted food preparation from the kitchen to the factory. It has simultaneously brought major problems of control to the manufacturer, the distributor, and the Food and Drug Administration.

There is little public information about the effect of varying processing techniques and sanitary conditions in the factory on the numbers and types of microorganisms in frozen precooked foods. Yet such data are essential to a sound evaluation of the adequacy and safety of manufacturing operations. To begin to accumulate basic data in this area, the Food and Drug Administration recently made a study of the frozen precooked foods industry, which covered a good cross-section of the products it now manufactures. We got a few answers. We found many questions for further study. Our inspections and recommendations resulted in substantial voluntary improvements in a number of plants. In some instances, we brought regulatory action against firms operating under grossly unsanitary conditions.

Meanwhile, the Association of Food and Drug Officials of the United States is engaged in the development of a model frozen food code. These several efforts have already resulted in improvement in the sanitary conditions initially found. We anticipate steady improvement in the manufacture of frozen precooked foods.

I want to close with an account of our most recent "big" case. It was "big" in the amount of effort that went into it both before and during its trial, and it illustrates the wide gulf that exists between our knowledge that a violation has occurred, or is occurring, and our having a case ready for presentation in court. Although the issue involved was a relatively simple one — the substitution of water, sugar, citric acid, and Vitamin C for orange juice — it did represent a typical example of a situation which required detailed and accurate knowledge of the composition of food.

This case involved a product labeled as fresh natural orange juice which was, in fact, grossly cheapened with added sugar and water. First inspections at the manufacturing plant in Texas revealed nothing unusual; no sugar was found on the premises and there were no indications that water, sugar, citric acid, or Vitamin C were being added. However, when we made chemical analyses of samples of the product, we found extra water and some or all of the other substances in the juice. Also, the juice had about half as much fluorine as the tap water in Houston where it was manufactured. Pure orange juice contains only about one-tenth the quantity of fluorides found in the suspect product.

To complete the evidence, a "stake-out" was arranged to place the plant under constant surveillance to establish the facts. This showed that periodically materials in sacks and drums were delivered to the plant and were stored in a locked shed-like building in the yard. Intermittently during the working day withdrawals were made and taken into the plant.

Armed with this information and accompanied by a marshal with a search warrant, our inspectors went back to the plant and found the hidden supplies of sugar and other ingredients. Later we proved that the firm had bought 750,000 pounds of sugar, as well as corn syrup and Vitamin C, under fictitious names and paid for the purchases in cash. Criminal actions were brought against four members of the concern, charging conspiracy and multiple violations of the Federal Food, Drug, and Cosmetic Act. The defendants were convicted and are currently charged with perjury because of their alleged false testimony at their lengthy trial.

• MR. FENN K. DOSCHER
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# Methodology for Industry

Perhaps one of the brightest points in this whole broad area of environmental health lies in conferences, such as this one, where government, industry, and health officials meet together to discuss their common problems and common interests. The fact that we are gathered here this week is testimony to the tremendous importance which each of us places on the need to develop a workable method to achieve our ultimate goal — better environmental health.

It is significant that one of the great forward steps in this very vital effort to approach an ideal, through cooperative planning, was taken right here at Ann Arbor. In June, 1948, men and women gathered from all sections of the country, from business, from industry, and from health organizations. They had but one objective — the improvement of the sanitation of their environment so that the people of the United States might derive a full measure of its benefits. These men and women devoted four intensive days to discussions, to the exchange of viewpoints and of ideas. This was the first National Sanitation Clinic.

The 1948 clinic dealt with 12 major subjects, involving food distribution and service. From the discussions, and from the recommendations drawn up during this four day period on the basis of research, study, and applied experience, the clinic hammered out a code for eating and drinking establishments, and opened the way for the development of a national vending code.

The results achieved at that 1948 meeting and the codes evolved at the conference table have been amplified, amended, enlarged, and changed since that date, but the important element of that fateful clinic remains intact. Vital as the discussions were during that four day meeting, the very fact of the clinic itself far outweighs in lasting effect the individual problems discussed and the recommendations set forth, for this clinic established a pattern of cooperation. Approached with high hope, but with some inner reservations, by the three diverse groups that met together, it proved that the hope for a lasting and meaningful improvement in the broad field of environmental health lay in mutual respect and cooperation.

The clinic concluded with a ringing challenge which encompasses every individual in the United States, for the far-sighted and public-spirited representatives who attended the clinic wisely pointed out that the responsibility for the improvement of environmental health cannot be relegated to any one group or combination of groups.

Rather, it is, and must be, the direct responsibility of each and every one of us. It must be sought on a local level, on a state level, and on a national level. It must reach into the home, the school, plants, restaurants, bowling alleys — in short, everywhere. Basically, a healthy environment will be achieved only when the need for it is forcefully brought to the attention of each and every individual within this land of ours, and when the need is translated into action so that each one does his part.

This optimum goal will not be readily, or easily, achieved. It will require continual research, conscientious and inspired educational programs, enlightened leadership, and positive action. It will require each of us to work untiringly so that we may see a broad application of this ideal within our lifetime.

I am keenly aware of the challenge, but I do not approach it with trepidation. Having been given the honor of participating in a joint, cooperative movement as vital as this one now

being conducted on the beautiful campus of the University of Michigan, I can only be optimistic as to the future of environmental health.

Prodigious obstacles lie ahead of us, but a great deal already has been achieved. Perhaps, we here today should review some of the tremendous strides which have been taken, so that we can learn from them and go forward from there.

No discussion of environmental health by someone from our industry would be complete without at least a passing mention of Samuel J. Crumbine, for perhaps no other man in our history so jarred the personal health habits of every adult in the world than did this untiring little country doctor. Dedicated, unfailingly curious, and completely absorbed in his work as a frontier doctor, Dr. Crumbine began his career in Dodge City, Kansas, when it was at the peak of its brawling notoriety. Although clinical work, such as it was in the early years of the century, absorbed his time and attention, he still was alert to all that went on around him. Traveling on a train, he was amazed, disgusted, and horrified when he saw a stream of tubercular persons, on their way to the state sanatorium, drinking out of a common cup used by everyone else. In those days, every railroad coach had a tin cup, usually attached to a chain, and in every Pullman car there was a heavy glass. Dr. Crumbine stood by helpless as he saw a tragedy occur: a man whose emaciation, facial characteristic, and hollow cough marked him as an advanced case of tuberculosis, took a long, refreshing drink from the common cup in the railroad coach, only to be followed by a tow-headed five-year-old girl who drank eagerly from the same cup. There were many who would have witnessed this same scene and passed it by as an ordinary occurrence, but not Dr. Crumbine. He knew that the so-called common drinking cup constituted a constant threat to public health. He also knew that to prove this to the satisfaction of the public would require clearly attested and proved facts.

In this, perhaps, lies the secret of Dr. Crumbine's greatness. He knew the danger. He knew something must be done to eliminate this danger, but he also knew that he must first get public opinion behind him.

Systematically, Dr. Crumbine began his campaign for the elimination of the common drinking cup from the railroad cars in Kansas. Setting forth to prove his stand, he enlisted the services of a friend of his, the professor of bacteriology from the state university. Every day for a week they made cultures from the swabbings taken from the common drinking cups and glasses of all trains entering Union Station at Kansas City, and from the cups used in a suburban public school. Identifying bacteriological investigations followed. February 21, 1909, a letter was sent to the general managers of all of the railroads operating in Kansas, pointing out the result of the investigation.

In this systematic, thorough, studied manner, Dr. Crumbine received the assured support of the railroads. When he approached the next quarterly meeting of the state board of health, the way was clear. The business most affected by the bill he proposed was on his side; and the evidence collected was irrefutable. As a result, on March 31, 1909, the nation's first bill outlawing the use of a common drinking cup for public use was passed.

This was the first effective official attack on an endless chain of infection; and it came about through the cooperation of business, government, and health officials, led by the crusading health studies of Dr. Crumbine. This untiring man continued his relentless attack against health problems. He is remembered to this day as the man behind the fly-swatter and his slogan, "Swat the Fly," has become a part of our language. This man would be almost a centenarian were he alive today, but during his more than four score years on earth, he was continually welding public opinion in the fight against public health problems.

It is a tribute to our free enterprise system that at virtually the same time that Dr. Crumbine was conducting his studies of the common drinking cup in Kansas, a group of independent businessmen were approaching this same problem in an entirely different, but no less vital, manner in New York. Taking a calculated risk, three young men — Henry Nias, Herman Elsas and Dory Kuhe — decided to invest $75,000 to see if they could develop a machine that would satisfactorily produce paper cups in quantity.

There were months of anxiety, hope, and experimentation. Finally, they developed a machine that was capable of making about 30 cups a minute. Modern design engineers would consider their machine a monstrosity, but to them it was a thing of beauty. What's more, it produced a five ounce paper cup, pleated, which would hold water — most of the time. They called it a "Lily" cup.

By 1911, the adventurous trio had achieved a good deal of confidence, for business men were beginning to have an interest in public health and sanitation. In September of that year, they got their first order for "Lily Cups." That first order, from the Bethlehem Steel Corporation, was for 2,000 cups. The total volume was something less than $10.00.

From the early days of this industry, sanitation and the protection of public health were the most compelling reasons for using paper cups. During times of great national emer-

gencies, the sanitary value of paper cups, and the industry's contributions to the national health, have come to the forefront, time after time.

During the influenza epidemic that followed World War I, for instance, the government used paper cups in hospitals, Army camps, and canteens in an effort to stop the spread of the disease. In World War II, paper cups and containers again helped to protect public health in war plants and military messes, PX's and ship's stores, schools and offices, bomb shelters and bombers, PT boats and aircraft carriers.

During the Korean War, the tremendous public spirit of this rapidly growing industry, and its impact on environmental health under extreme conditions, were brought to the attention of all Americans in the industry's nationwide stockpiling program. As you all know only too well, in 1950 the threat of a United States invasion hung over our heads like the Sword of Damocles. The nightmare possibility was there — foreboding, constant, and ominous. Facing this peril, the Paper Cup and Container Institute — not one individual company, but an association of 17 companies engaged in the competitive manufacture of paper cups and containers — undertook to meet its responsibility.

It was acutely aware that any bombing attack, atomic or otherwise, would leave in its merciless wake a multitude of homeless, injured, and dead. Coping with such a disaster would require the services of Civil Defense workers, as well as those of every other able-bodied citizen. They would be called upon to supply emergency feeding — prompt service of food, liquids, and medicines — in spite of the chaos and the possibility of limited, contaminated, or nonexistent water supplies.

Paper service seemed to be the answer. The Paper Cup and Container Institute, without cost to the nation, voluntarily set up vast stockpiles of 25 million cups and containers in 20 strategic locations throughout the country. These were clearly marked, "For Disaster Use Only." Then, cooperating with the local Civil Defense, Red Cross, and public health officials, the Institute set up a briefing program so that the personnel of each of these agencies would be fully cognizant of this stockpiling program, its purpose, the locations of its warehouses, and all other details of its operation.

Coincidentally, a similar educational program was conducted by the Institute, in conjunction with Civil Defense authorities, to alert government officials and the general public on the needs for, and purposes of, the project.

Everywhere across the nation, local, state and national officials joined in extending a warm welcome to this public spirited program. Mayors, governors and other officials participated in dedication ceremonies, which marked the inception of the stockpiling program in each of the selected communities.

The Institute's stockpiling program, although mercifully untouched because there was no direct bombing attack, nonetheless served a vital function. It did much to focus the nation's attention on the very essential issue of environmental health. During the war, the Field Research Division of the Institute released a steady flow of general information about emergency feeding — its problems and how to prepare for them. This was brought to the public's interest through the news and feature columns of newspapers, through trade journals, and through radio and television newscasts. The results were a growing public awareness of the need for sanitation and an increased emphasis on the importance of public health by local, state, and national public officials, and by private citizens in every state.

In the years following the Korean War, these vast stockpiles of unused paper cups and containers continued to be used for the public good. The Institute, with the endorsement of the Federal Civil Defense Administrator, broke up its stockpiles of paper cups and containers. These were presented to cities located in critical target areas, to be used for training personnel in the continuing program of Civil Defense. Some of these Korean War stockpile cups and containers are still held by Civil Defense locations today. Millions of them were used during the intervening years to help Civil Defense, Red Cross, and Salvation Army workers cope with emergency feeding operations following floods, hurricanes, and similar disasters within our country.

The Institute's stockpiling program is a dramatic example of how an industry can work with government and health officials to meet a common problem. However, I can think of other, equally important, examples of this same three-way cooperation whose origins were not forged in the fire of war.

In the area of education, for example, a six page leaflet prepared by the Institute was made available to the nation's teachers for use in public, parochial, and private schools. Noncommercial, this leaflet, "Cups Through the Centuries," reveals the fascinating history of mankind through the drinking vessels man has used, from the very early times when man probably took his first drink by scooping water in his hands up through the years to cups and glasses as we know them today. By capturing the student's imagination in this absorbing tale of Grecian pottery, Saxon horns, Venetian glass,

and wooden tankards, the Institute skillfully and unobtrusively projects in the reader's mind an interest in the need for good health habits in his daily living.

On a far different level, but following the inspirational pattern of this educational leaflet, the Institute presents its annual Crumbine Awards. Partly to commemorate the distinguished doctor, but largely to stimulate better public health administration, the Crumbine Awards were established by the Public Health Committee of the Institute in 1954. Environmental health was selected as the specific area to be recognized. Two awards are given annually: (1) in the development of a comprehensive program of environmental sanitation; and (2) in the development of a program of eating and drinking sanitation. Selection is made by an independent jury. Plaques are awarded to the winning departments, and medallions to the health officer and to the director of the environmental health program of the winning department.

Valued as these annual awards have become among the nation's health departments, their real value extends far beyond the intrinsic worth of the award itself. Properly used, such an award can demonstrate the value of qualified personnel and of expert administration. It can alert an entire community to a better understanding of public health. The value of the competition is real, too. Reports over the last six years reveal that completion of the entry form forces a purging effect upon every participating department. The questions asked on this form have been selected with care, to search out weaknesses and strengths. Participating departments are bound to uncover neglected program "dead-ends." The competition entails work; but the good resulting from it can almost be guaranteed, even if the participating department should not be singled out as a winner during that particular year.

The annual Samuel J. Crumbine Awards have had another important side effect. They have served to pinpoint a single characteristic which each of the award-winning health departments has in common. Since many less successful departments do not have this characteristic, it would seem to rank almost as one secret of success. This characteristic is the habit of informing the public early about the department's activities. Although a formal citizens' vote may not be taken on a specific public health project, the people in the area will offer it little support unless they have been shown how it will help them or protect them. Dr. Crumbine knew this secret. He saw an appalling situation; but he solicited the support of the industry his solution would affect, before he attempted to have the situation rectified.

So it is today. The most important single thing the Institute has observed, in gathering information for its awards, is that enforcement is generally easiest when the public health officer has created an environment where the following conditions exist: (1) operators want to cooperate, because they themselves have helped to make the rules and know they are sound, and because they recognize the dollars and cents value to them of these rules; and (2) outside pressure has been enlisted to help secure enforcement.

A little less than a year ago, an excellent example of this enlightened approach to environmental health took place in Washington, D. C. In June, 1960, 22 people gathered around a long conference table in the Health, Education, and Welfare Building. Sixteen of these men were consultants from across the country, some from industry, some from state and local health departments; the rest were staff workers from the Public Health Service Division of Sanitary Engineering Services and the Robert A. Taft Engineering Center in Cincinnati. This group had set before it a monumental task: the development of a new Food Document. They sought one which would put greater stress on (1) good daily practices, (2) proper use of equipment, (3) approved methods, and (4) more enlightened food service operators and employees. Moreover, it had to be well-founded in law.

Here was methodology at work. Industry was an active participant in the complete formulation of a new Code. This meeting highlighted industry's growing awareness that business operates in a social, as well as an economic, climate; it emphasized the new status of today's public health official, who serves the public as an educator, not as a policeman, by working in conjunction with industry for the common good; and it located government as a working partner of each.

The development of a new Food Document necessarily involved a national meeting. There are, however, many local examples of industry, government, and health officials working together for the common good.

In San Diego, for example, the health officers took four steps to make their inspection program of 1,915 restaurants more palatable to operators, and thus make the inspections more productive and faster: (1) they developed their regulations in cooperation with the operators; (2) they saw to it that their new sanitarians got enough training to command operators' respect before going out; (3) they told the public, through newspapers and broadcasts, the advantages of going to well-managed restaurants; and (4)

they brought in state health department officials to make an independent evaluation of the progress the restaurants were making. By bringing everyone into the act — making it a team project, not a policing action — San Diego health officials were successful in bringing 1,841 restaurants, out of the original 1,915, up to standards meeting "A" card requirements.

In much the same manner, health officials in Albuquerque, New Mexico, armed themselves with helpful "how to" materials before initiating their sanitation drive on motels in that area. First, they contacted the industries involved for "promotion materials and exhibits." Next, they started a systematic inspection of the motels, checking them on sanitation and particularly on their use of sanitary drinking and eating utensils. By virtue of this educational program, they showed the motel operators how they could solve their sanitation problems easily and inexpensively. As a result, the drive was 75% successful.

News of sound health programs, such as those carried on in San Diego and Albuquerque, are reported in detail in the Institute's monthly *News Digest*. Distributed regularly to some 13,000 persons, this pocket-sized *News Digest* feeds news on the broad area of public health to government, education, and health officials, as well as to many industry groups. It is a continuing record of the work being conducted on local, state, and national levels to achieve improved environmental health.

I have drawn upon my own industry for examples as to how government, industry, and health officials can cooperate for better environmental health because I am personally acquainted with its long, continuing fight to approach the ideal. Certainly, this does not mean that I fail to appreciate, and to applaud, the many outstanding programs other industries have promoted in the interest of environmental health.

While many other countries still suffer from beri beri, scurvy, and other such nutritional diseases, these dread ailments are virtually, if not totally, unknown in our country. Diseases common in the United States a brief 20 years ago are now eliminated, or their effects sharply reduced. You all know the story of Salk (who worked in this building for five years) and his life-saving vaccine. Tuberculosis and pneumonia no longer hold the dread they once did, because they can be brought under control or, in many cases, cured. Children now are immunized against many of the childhood diseases which once were the cause of grave concern. As the result of these monumental medical and health service advances, life expectancy in the United States is now at an all-time high. Life insurance tables now list man's life expectancy at 69.3 years; just 60 years ago, this was given as 47.3.

Much of this progress has been possible only through research. The huge grants of the industrial foundations, such as the Rockefeller Foundation, have made accessible the monies essential for such research projects. Well-established and heavily funded research projects, such as those now engaged in cancer and heart research, promise hope for the future.

A continual program of health education carries the need for personal hygiene right into the home.

The adoption of industry-wide codes set standards from which no company within that industry can deviate. Such codes are carefully observed within each industry, for any public-be-damned company which ignores the industry standards hurts not only itself, but the entire industry.

As has been brought forth repeatedly in this congress, much has been done in the field of environmental health, but there is much that needs to be done. We have been hampered by antiquated sanitation standards, by outmoded laws, and by the need for more education, both of government and of industry. Yet we can take renewed strength in meetings such as we are attending this week.

I have implicit faith in the free enterprise system. I am convinced that where you find government, industry, and health officials gathered together for a meeting of minds — where they willingly subject their individual, and perhaps selfish desires, for the common good; and where they become welded together as an indivisible force for action — surely, there you will find the *modus operandi* through which we will realize our goal.

• LEONA BAUMGARTNER, M.D.
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New York City
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# Methodology for Government

A mystery of biological science is the way the original cell from which the living being develops, somehow divides and multiplies, finally differentiates into arms, legs, eyes, and all the other parts of which we are made.

To me, a mystery of social science is the way the national organism divides into groups tending to separate one from another. Mr. Doscher comes here, and he is called "industry," which he is; and I come here and am called "government," which is true in part, but let us be clear that I am here to represent only a service area of the vast complex called government. But this stresses the difference and not what Mr. Doscher and I have in common.

For we *are* the same organism, government and industry, and we had better not forget it. Not at this point in history.

My subject is "Methodology in Government," which I am told means how we do some of the things that are necessary to improve public health, but I want to emphasize that we in government do these things with people, not by ourselves. Our methodology is not for government alone, but for the community.

To understand clearly present activities in the field of public health control of the environment, we need to review the development of these activities. I will talk about three periods in the development of environmental controls by governmental public health agencies: first, the period of the use of police power; second, the period of health education; and third, what might be called the period of mandated self-inspection, which is what we are in now, and about which I want to say more than about the others.

The authority commonly given public health officials grew, in part, out of the fact that people were frightened by the great epidemics that characterized the middle ages. Here is Guy de Chauliac, discussing the plague of 1348 in Avignon:

> Many people were in doubt about the cause of this great mortality. In some places they thought that the Jews had poisoned the world; and so they killed them. In others it was the nobles; and they feared to go abroad. Finally they reached the point where they kept guards in the cities and villages, and permitted the entry of no one who was not well known.

De Chauliac mentioned two kinds of plague. Of the second he wrote:

> It was so contagious . . . that not only by staying together, but even by looking at one another, people caught it, with the result that men died without attendants and were buried without priests. The father did not visit the son, nor the son his father.

Here were terrified people, threatened by something they did not understand, taking various kinds of action, some of it wholly irrational. Obviously here was a problem that could not be handled by individuals acting on their own, or locally, and so unusual and great powers were given to newly formed bodies, often designated Boards of Health. The guards described by de Chauliac were an early and primitive example of police action rising from these new powers given government.

Even when the New York City Health Department was finally created in more or less its present form, in 1866, the action was taken under the pressure caused by a recent cholera epidemic and as a result of public demand.

Health laws were passed and were enforced like other laws. Violators were arrested by the

police. In fact, at one time, New York's health inspectors were actually part of the Police Department. And when Theodore Roosevelt became president of the Police Board he automatically sat on the Board of Health.

The three periods of which I am speaking did not begin and end abruptly, like lectures at a university, but overlapped and merged. In any event there occurred, around the turn of the century and shortly after, a tremendous increase in general education on health affairs. Some of this increase in education was planned and some of it just happened. Thus began the second in the periods I am discussing.

The Spanish-American War produced the scandal of "embalmed beef" for the troops, an early example of a food additive or preservative, and it also brought the virtual elimination of yellow fever from Cuba by Gorgas, Reed, and Finlay. These and other stories were widely publicized. In passing, it is interesting that this period also saw the beginning of the general use of newspaper headlines, as we know them today.

The Chicago Tribune shocked its readers several years in a row by printing a list of persons maimed and killed by fireworks on July 4 in a number of major cities, and in 1903, St. Paul, Minnesota, adopted an ordinance prohibiting the use of certain explosives and other dangerous materials to celebrate the holiday.

The Rockefeller Foundation campaigned against hookworm in the South and John D. Rockefeller gave seven million dollars for research on a tuberculosis serum. As the people were later to learn about ileitis and coronary thrombosis when President Eisenhower was ill, so they learned about peritonitis when President McKinley was shot at the Pan-American Exposition in Buffalo.

Some early efforts at health education were planned, and business and voluntary associations joined in many of them. One of the business concerns active in the field in the early days was The Metropolitan Life Insurance Company. The company undertook a demonstration at Framingham, Massachusetts, aimed at putting to use what was already known about tuberculosis, its diagnosis, prevention, and treatment. In seven years the death rate from tuberculosis in Framingham was reduced by 68%. This was accomplished without wonder drugs, by using just what was then known.

Some health problems were things people just didn't talk about. Jacob Riis raged about the relationship between prostitution and poverty and wrote: "Come to think of it, I do not know but that wholesome, plain speech on this subject is nearer the whole than half the battle."

But it was not until 1928 that the famous advertisement entitled "THE GREAT IMITATOR" and speaking of syphilis by name, appeared in American magazines. And the word was not generally used until the thirties, when Thomas Parran wrote "Shadow on the Land, Syphilis." And when he first proposed to use it on radio he, as Surgeon General, had to agree to be cut off the air if a single call of protest came! Fortunately it didn't.

So we went through a period of what might be called fact spreading. It was an improvement over total reliance on police action. People learned more and more about health affairs. Health departments and others printed thousands, millions of pamphlets. We did not know enough then (or now, for that matter) about educating people to action. A lot of our pamphlets went unread, sometimes because of the way we wrote them, and sometimes because they were not delivered to the people we needed to reach. But we did teach a lot about public health, and we were making progress.

Each of the periods we went through had within it the seeds of what was to come. Indeed, Lemuel Shattuck said in his famous 1850 report, "Local Boards of Health endeavor to carry into effect all these orders and regulations in a conciliatory manner; and . . . they resort to compulsory process only when the public good requires." He was many years ahead of his time.

Now we are in what I like to call a third period. You will see how different it is from the mere enforcement of laws, and from routine health education activities.

To illustrate, I want to tell you some of the experiences we have had in New York City working with industry and other groups in achieving certain necessary public health goals. But let me emphasize that health education is still an integral part of the process.

For example, we have the job of making sure the city's eating places are clean. We started with police methods. We inspected these places and people got tickets. This didn't help much. We looked for the cause of filth. We found some equipment really couldn't be properly cleaned. Some of the gadgets being used couldn't be cleaned because they couldn't be taken apart. Others needed special tools. Others were constructed so there were nooks and crannies no one could get at.

So, we called together the manufacturers of soda fountain equipment. This was beyond police power. Certainly a local governmental agency has no legal authority to call in manufacturers from, say, Pittsburgh, and make them come to New York. But they came.

We said to these people: "A lot of your equipment needs to be redesigned. It can't be cleaned,

and if you don't do somthing about it, there will be difficulties here in New York. Moreover we don't think it's good business for you to put out this kind of equipment."

The soda fountain industry said to us: "Yes, you're right, but if we start redesigning equipment to your specifications, then San Francisco may come up with a different set of rules, and then Boston, and so on."

They said: "Give us a chance to do this on a national basis." And they asked us if we knew anyone who might be interested in helping them. We said, "Yes, the National Sanitation Foundation."

The rest, I'm sure, is known to most of you. The National Sanitation Foundation held a large clinic here in 1948, inviting representatives of industry and of government, large and small.

Five years later, in 1952, national standards for soda fountain and luncheonette equipment were published. They are now incorporated in the Health Code, the official health laws, of the City of New York. They are accepted by the vast majority of communities in the United States. They are pioneering examples of close cooperation on a national level between government, representing the public, and industry. The whole operation is a tribute to the National Sanitation Foundation, the Kellogg Foundation, the University of Michigan, the Soda Fountain Manufacturers Association, and to the public health workers who initiated and participated in this bold venture.

The problem of cleanliness in restaurants has also been a complicated one. The equipment used is important, and it has to be easily cleanable. But the heart of the matter is cleanliness, the habits of the food handlers. Proper handwashing is a must. Absence of it often leads to food poisonings. Naked law enforcement will not solve this problem. The employees will wash their hands when some one watches, but until they are convinced that it makes sense, that it is vital to wash their hands, the problem is not solved.

The people who wash dishes or work in restaurants, come out of the high schools. So we went to the Board of Education and asked them to set up a special school of food sanitation. They did. We trained youngsters there and gave them certificates when they graduated. And we said to the restaurant people: "Hire them, they're good." And they did. And to these youngsters we said: "You've got a certificate that will make it easier for you to get a job." And they found that this was so.

I might say parenthetically that we have 22,000 restaurants in New York City and more than 5,000 change hands in an average year. From this evidence, I think there are two reasonable conclusions — either these owners make enough in one year to retire, and this is not too likely, or it is a chancy business.

Little by little, the restaurant people realized that trained employees were better than untrained, and that running a clean restaurant was good business.

Thus we moved away from raw police power. Now we give inspection check sheets to the good restaurants and they check themselves. We still make inspections, of course, but the emphasis is on responsible self-policing by the restaurants themselves. It works for them, and for the Health Department.

Let me give you another case history, on the cheerful subject of rats. New York is not a rat infested city. We have a lower incidence of rat infestation than the average throughout the country, partly because so many of our buildings are made of concrete, cement and steel, and also because we have been working hard on the rat problem for many years. But we do have local foci of rat infestation, particularly where housing and living conditions are bad.

We put on an education program. We printed circulars, and we got help from radio and television and newspapers, telling people how to avoid attracting rats. But this seemed to have only a slight effect. So we hired a man and sent him to the part of town that was most troublesome, and gave him the job of involving the community.

He met with community organizations, and he asked for volunteer workers, local housewives, to visit tenements in the neighborhood. These volunteers would teach the people what to do about storing food properly, about getting a garbage can, and so on.

Then we called in the chemical industry, the people who make exterminating compounds, and we said: "We're putting on a drive against rats, and we want you to push your sales in New York as much as possible." The industry said: "All right, and we'll do more. We'll give free exterminating compound for demonstration purposes." A great many promotional activities were devised by the industry.

Then we went to the professional exterminators and asked them for help. They said they were glad we were campaigning against rats, but that exterminating should be done an entire block at a time after getting the approval of all the landlords involved. This is now going on.

So, there we were with the chemical industry, the exterminators, the public, and finally the real estate industry. We received some help from the real estate industry after carefully explaining what we were about. We were forced to

prosecute some cases where the landlords were delinquent, but at least, due to our educational program, they, the judges, and the public understood why.

We have worked with industry on many problems. For instance, we used to average 242 deaths a year from defective gas refrigerators. We worked with all hands, from servicemen to manufacturers to utility companies. The manufacturers, exhibiting corporate citizenship of a high order, put full-page warning ads in the newspapers, and the utilities ran training schools. Everybody helped. Last year we had eight deaths, a drop of 234.

We have worked with the chemical industry, pressing for appropriate warning labels on hazardous chemicals. Some large companies like Du Pont and Merck developed their own safe labeling committees, and their recommendations have often been more stringent than government requirements.

But change is not always easy, in industry or government. I find, for example, the regulations concerning the handling of milk and the manufacturing of milk products, frozen desserts and the like quite fascinating. We can, to be sure, be proud of the almost complete absence of milk-borne disease in many parts of this country. Surely this was achieved both by the vigilance of governmental agencies, particularly in the earlier days, and the technological advances made in pasteurization processing, et cetera. Gone are the hand milkers, the milk pails, the many transfers in wagons, autos, trains. Most of the milk coming into New York today is transferred directly from the cow's udder to a breakfast table 400 miles away in a closed system; i.e., from automatic milking machine, to refrigerated tank, to pasteurizing plant, to paper container, to refrigerated truck, to home or store. Yet the detailed regulations on the books today are those set up to protect the public in the days of the three-legged milk stool, the open milk pail, and when pasteurization was a luxury. The status quo is guarded by the milk industry. Are the regulations still necessary? No one locality can change them, for state and national regulations are too involved. The economy, the public good should not tolerate unnecessary inspections and expensive controls. This is a situation in which government and industry must jointly find intelligent answers. And it is a problem in which the National Sanitation Foundation could well play the leading role.

I want to mention very briefly other areas in which we are now working with industry.

We're interested in swimming pools, the kind people build on their own property. As you probably know, the National Sanitation Foundation is working on standards. It will be quite a job, because there are as many variables as there are hairs on the heads of public health people.

We're working on radiation. We first got into it because of fluoroscopy machines for fitting shoes, but we weren't too worried. We set up some regulations for their use. Then came the bomb. Scientists began to make estimates of the amount of radiation that could be considered tolerable. (Fortunately, these estimates have been getting smaller.) We tested those shoe fitting machines and found they were giving off hazardous amounts of unnecessary radiation. The machines were outlawed.

We had overlooked, of course, the major source of radiation hazard in the community, the improperly installed or used x-ray machine in the hospital, medical or dental office. Now we are well on our way to helping make the use of this equipment, so essential in modern medical and dental practice, safe for all concerned. Again we're working with the industry, the manufacturers, the commercial servicing units, just as we did when we were helping develop better practice in the soda fountain business. We are still inspecting all equipment, but we look forward to the day that self-inspection will take care of most of the problem as it does in restaurants.

We are working with the paint industry, too. Lead paints are dangerous when they are used indoors. Lead poisoning is a miserable thing. Gradually, over the years, manufacturers have substituted titanium for lead in their indoor paints. But in old housing as we have in slum areas children get lead from the flakes of paint from walls, from window sills, from furniture, all painted years ago. The industry has responded very well in changing and labeling its paints, and we are now working with the National Paint, Varnish and Lacquer Association in New York, to try to work out some joint program for getting this old lead paint off the walls.

Here again government and industry are working together on what at first glance seems an odd project, but is an important one.

Let me mention two specific areas in which I think much greater progress in working together must be made.

The first is the housing industry. Here our progress (and I am not thinking just of New York City) has been slower than it should be. The key to the problem, as has been stated again and again, is that there is too much money in slums. Slums provide quick, substantial profits for little investment, and the growth and the continuance of slums is a blot on our technological education.

If the profit could be taken out of slums, the

problem would be half solved. The responsible people in housing know that in the long run, well-kept buildings are better than those which are not. Better for the owner, for the occupant, for the public health and welfare. The real estate industry needs to rid itself of its own worst operators. The man who puts little cash into a piece of property and bleeds it to death should be shoved aside by the rest of the industry. He makes money, but he doesn't put it back in housing. He has little in common with those who are really interested in housing.

A second growing problem in public health concerns the drug industry. Many physicians are bothered by the frequent lack of adequate clinical investigation before drugs are introduced and promoted. Some of the advertising of ethical drugs takes the form of planted stories that reach the layman before they reach the physician. The doctor often finds his patients asking for drugs on which he has received little if any technical information.

It was just a little over six years ago that the Salk vaccine was introduced after being pronounced effective by Dr. Francis at a meeting here. Dr. Francis could tell you much about the painstaking care that went into the evaluation of that vaccine, and of the field trial for testing it. There was criticism of the way that vaccine was tested and even charges that it was hurried into use. I can only tell you that if every drug was required to have as much testing as the vaccine had the great majority of today's quickie drugs would vanish from the shelves of the pharmacies, and a majority of the flashy advertisements in many leading medical journals would disappear.

The Federal government is moving into a more vigorous program of control of drugs and of food additives. These are not easy problems, but they must be solved. Physicians have a real problem and a responsibility which they must take more seriously. The public expects, demands, deserves protection. It is good business, good government, good medicine to give it to them.

In closing, it seems clear that with the promise of an expanding, explosive development of science and technology, most of man's ills will in the future be man-made. As he creates his new environment he creates his own hazards, his own aches and pains. There is, therefore, an increasing need to build into the new technology, into developing industries, an increasing concern for the safety and welfare of man himself. This must be done at a rate commensurate with the rate of the technological and industrial development itself.

Never was the adage, "An ounce of prevention is worth a pound of cure," more true. The time to begin is now.

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## 460 Poison-Control Centers

The number of poison-control centers affiliated with the National Clearinghouse for Poison Control Centers rose to a new high of 460 as of July 1, Surgeon General Luther L. Terry of the Public Health Service has announced.

"That the poison-control center fills an urgent and widespread need is evident from the rapid growth of the movement since the first one was established in Chicago in 1953," Dr. Terry said. "It is also interesting to note that the movement was started by practicing physicians, in this case pediatricians, rather than by public health agencies. It was entered and coordinated in the Public Health Service in 1957 on the recommendation of the physicians operating the individual facilities."

The National Clearinghouse for Poison Control Centers serves local centers by providing information on new products which it obtains through a voluntary arrangement with manufacturers. Over 200 major producers of drugs and household products inform the clearinghouse of the ingredients their products contain and the antidotes for them. The National Clearinghouse is directed by the PHS Division of Accident Prevention.

The centers maintain records of ingredients of trade-name products plus antidotes. This information is available to physicians by telephone day or night. Parents who call the centers are given first-aid instructions and are advised to call their doctor. Poison-control centers are now spread throughout 48 states (all except Vermont and Montana), the District of Columbia, Panama Canal Zone, Virgin Islands, and Guam.

The Hazardous Substances Labeling Act, when in full operation, should facilitate the work of the poison-control centers. The new law requires that safety information be given on labels of household chemical products, including the identity of hazardous ingredients, antidotes for toxic substances, and warnings and precautions needed for safe use. The law is now fully enforceable with regard to highly toxic and flammable substances. Requirements for labeling other hazardous articles are scheduled to go into effect February 1, 1962.

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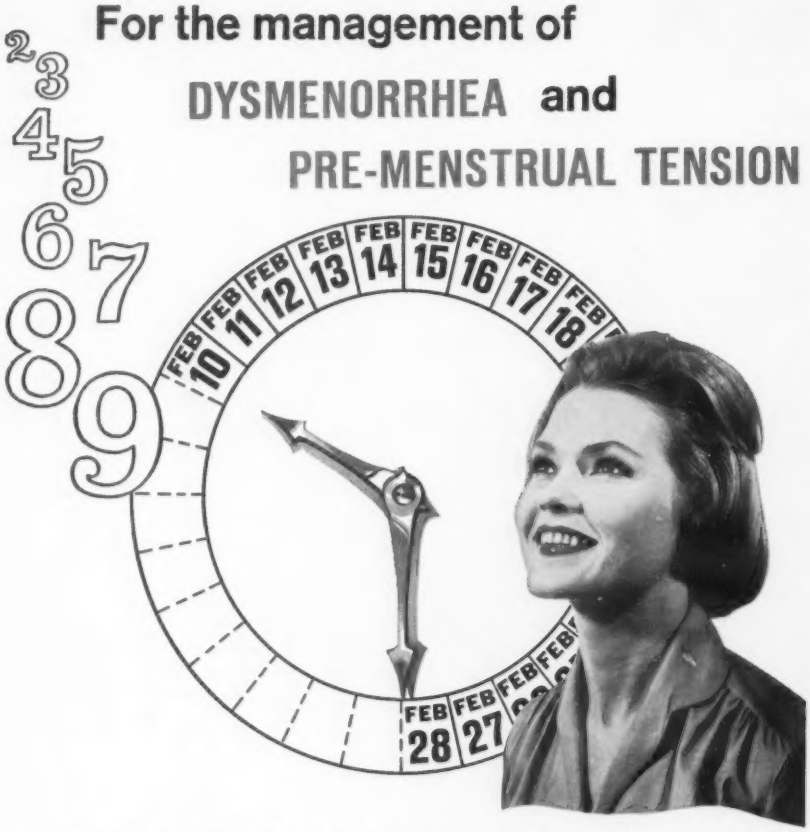
# For the management of
# DYSMENORRHEA and
# PRE-MENSTRUAL TENSION

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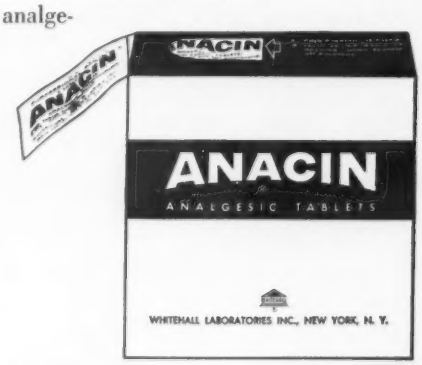


Better than aspirin
or any buffered aspirin

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# COMMENT AND OPINION

## Industrial Medicine in Action

A new film produced by the U.S. Air Force and released through United World Films deals with toxic chemical agents encountered in many industrial operations. It is designed to inform factory management as well as the medical profession of the dangers to personnel in such an environment as well as to suggest ways of safeguarding exposed workers.

Entitled *Industrial Medicine in Action*, the 29 minute color film emphasizes the need to evaluate carefully working conditions in shops and on flight lines and stresses the importance of protecting workers from toxic chemical agents. Hazardous environments are shown in which conditions may affect the respiratory tract, gastro-intestinal tract, produce skin and lung irritations and bring about exposure to strong solvents, acids, gases, radiation, noise, burns, etc. Proof is provided that periodic physical examinations of workers and the furnishing of proper protective equipment together with adequate ventilation will insure maximum freedom from dangers present in these environments.

For information regarding the public use of this film write to United World Films, Inc., (Government Dept.) 1445 Park Avenue, New York 29, N.Y.

## Hydrocyanic Acid

Hydrocyanic acid, its properties and recommended safe handling and use practices, are described in the latest in a series of chemical safety data sheets now available from the Manufacturing Chemists' Association, Inc.

The pamphlet, SD-67 (revised), details the engineering control of health, fire, and explosion hazards of the chemical and discusses employee safety education and training and personal protective equipment recommended while handling it.

In addition, the pamphlet suggests proper handling and storage practices, tank and equipment cleaning and repair methods, waste disposal, medical management methods, and first aid.

This revised edition of SD-67 differs from others of the MCA safety data sheets in that it contains detailed information of valves and piping for use in HCN service; on storage, including transfer of HCN from tank car to storage tank; and on procedures in time of emergency.

Copies of the safety data sheet are available from the Association at its headquarters, 1825 Connecticut Ave., N.W., Washington, D.C. for 30 cents each.

## A Call from MEDICO

MEDICO is increasing the number of medical personnel serving in its overseas hospital and clinic installations. There are 15 MEDICO-supported units in 12 countries in various parts of the world. New requests are being received for additional medical and surgical teams in South America and in the newly emerging countries in Africa.

At present, surgeons, internists, general practitioners, and anesthesia specialists are needed in Afghanistan, Cambodia, Vietnam, Malaya, Laos, and Haiti. Salaries, length of service and specific information concerning each project will be sent on request to MEDICO, 420 Lexington Avenue, New York 17, N.Y.

## Health Statistics Report

From data collected in the National Health Survey during the period July 1958-June 1959 on the civilian, noninstitutionalized population of the United States, it was estimated that 1,161,000 persons had hearing aids; that is, one person out of five with a hearing impairment had a hearing aid.

Based on persons with hearing impairment, more females than males had hearing aids, and the rate of hearing aids was consistently higher in urban than in rural areas with the magnitude of the differential by residence increasing with age.

Approximately 253,000 persons possessed wheel chairs during the data-collection period. About 54% of these persons were confined to the house except in emergencies.

Estimates of 201,000 persons


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POSITIONS OPEN

**Head Department:** Lge firm, sev plants, 40,000 empl; sev in med dept; most mod facils; reqs phy w/warm personality; exc oppor; MW.

**Chief Physician:** 4000 office empl; some minor surg; complete lab & X-ray facils; pref Bd, int med or occ med; $18,000 to run & dev med unit to one of best in land.

**Assistant Medical Director:** Electronics; 9,000 empl; impor co will expand their med facils to other US & foreign plants; exc oppor rapid advance in impor co; SW.

**Assistant Medical Director:** Co w/2500 empl, regnl plant; mnt resort area; exc future & financl oppor; South Atlantic.

**Head Department:** W/PH; Alaskan dispensary leadg firm, good money, travel & maintnc provided for single man; exc oppor.

**Staff:** 5 days; 9 to 5; 5 MDs in dept; $12,-$14,000; diagnostic; good post E-coast.

**Staff:** Good for Bd credit; regionl plant w/ 6 MDs; leadg co; $12-$21,000; Pacific-NW.

**Staff:** 2nd in dept, plant w/own hsp; $14-$15,000; very busy; pleasant MW area.

**Staff:** Some surg; plant 20,000; leadg hvy indus; $13-$20,000; lge twn Mid-East.

**Private Industrial Medicine:** (a) indus phy, join 33 Bd spec; city 175,000; sev indus using clinic facils; exc oppor; will build dept to suit; W. (b) Assoc w/Md; very busy priv pract small plant occ med; $15-$16,000 1st yr; %; twn 37,000; Mid-E. (c) Indus med grp, 3 man, 1 Bd surg, all FACS; exc oppor; MW.

POSITIONS WANTED

**Medical Director:** Dipl, prev & occ med; Ph. D, indus med, U of Pittsburgh; 1 yr chief phy import chem co; 4 yrs, dir indus hygiene, import organ; 5 yrs dir both med dept & dept of safety lge indus firm; seeks dirshp w/greater scope; training isotopes and radiological defense; recommend.

**Medical Director:** Dipl, prev med; Cert, occ med; Doctor of indus med, U of Cincinnati; 10 yrs, indus med, seeks post w/challenge.

**Medical Director:** Dipl, prev med; Cert, occ med; MPH; 2 yrs plant phy, leadg co; 5 yrs plant phy in charge, lge pharm co; seeks dirshp lge co or plant chief phy; exc trng.

**Medical Director:** 3 yrs, res, int med; 3 yrs, fellow, indus med; 4 yrs, chief, occ hlth div, & asst med dir, lge co; 2 yrs, dir, cl div, impor indus lab, assoc prof, indus med & chief phy lge regional plant, nationally known co, soft indus; Dipl, prev med in occ med; outstandg man, extremely competent; mid 30s.

**Medical Director:** Dipl, prev med; post grad work, cardio & electro, occ med, leadg schls; 20 yrs exp indus med, firm operatns transfrg to S, wishes remain in E; highly recommend.

**Medical Director:** Cert, prev med in occ med; 10 yrs exp occ dis consultant, labor board; 4 yrs plant med dir leadg E firm; FAAOM; FACPM; FIMA; seeks challenge; pref East.

**Staff:** Completg formal trng, import schl PH; Bd elig, occ med; desires post w/oppor for career advancemnt; pref SE area; 33.

**Staff:** 10 yrs exp part-time plant phy, hvy indus, coupled w/priv pract GP; seeks indus med post, full time w/potential; any loc.

**Staff:** 29; now completg 2 yr occ fellow in indus med, leadg univ; Bd elig, indus med; DNBM; pref post w/lge indus; immed avail.

**Staff:** 35; 4 yrs plant phy & 2 yrs med dir, lge plant; seeks post w/oppor future & educatnl oppor; pref MW or Pacific coast.

**Staff:** 32; exc avia & prev med exp; seeks indus post w/growth potentl; diplomatic & well trnd phy; speaks Germ, Dutch, Spanish.

**IF IN NEED OF MEDICAL PERSONNEL OR WISH TO RELOCATE, PLEASE WRITE US SO WE MAY PREPARE AN INDIVIDUAL SURVEY FOR YOU**

with leg or foot braces and 494,000 with other types of braces were obtained from the survey. About 82,000, or 41% of the leg or foot braces, were reported for children under 15 years of age, and about three fourths of the 82,000 reported were worn because of conditions due to poliomyelitis or of congenital origin.

Of the estimated 139,000 persons with artificial limbs, 132,000, or 94%, were reported for males. About 106,000, 76% of the total number, were persons with an artificial leg or foot. Based on the 274,000 persons who reported absence of major extremities during the survey period, July 1958-June, 1959, it is estimated that approximately one half of such persons had an artificial limb.

—*Health Statistics*, Series B-27, June, 1961.

## Compensation Board Reports

Col. Solomon E. Senior, Chairman of the New York State Workmen's Compensation Board, reports that the state's "R" Program — for Rehabilitation and Restoration of the injured worker — may prove to be the "wonder drug" and national savior of a sound workmen's compensation system.

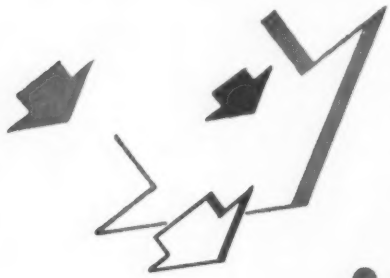
"Our attempt in New York State to promote and encourage rehabilitation of the injured worker, with the aim of restoring him to maximum employability," said the Chairman, "should be, and I believe always should have been, the principal objectives of compensation. A review of our experience with the Rehabilitation Program over the first full year of operation, 1960, indicates that 26% of the serious cases reported — 4,102 workers — are undergoing planned rehabilitation."

In a review of the highlights of 50 years of workmen's compensation in the United States, before delegates to the 65th Annual Convention of the Allied Printing Trades Council of New York State, Col. Senior said some of the shortcomings of the system nationally have been failure to achieve complete and universal coverage of all workers, and saturation of the system by legal jousting, litigation, and the slow, costly court process which compensation was actually set up to eliminate.

Sound rehabilitative efforts, begun as quickly as possible and pursued thoroughly and sincerely, offer the best hope to the injured workers, the Chairman said, and also to the successful re-emergence of workmen's compensation as a prime social system.

On the administrative level, Col. Senior reported that a number of revisions in operations and procedures of the State Board have been put into effect. These include the elimination of unnecessary litigation from which the worker derives no benefit. Some 50,000 less hearings have been held during each of the past two years without loss of rights to workers, and there has also been a general reduction in the time lapse for settlement of cases from several months to several weeks.

Other administrative im-

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for MOOD-CHANGES . . . **CYCLEX supplies the effective relief of meprobamate for nervousness, irritability, tension, nausea, malaise, insomnia**

for GI DISTRESS . . . **CYCLEX affords quick-acting relief of nausea and bloating associated with premenstrual tension**

SUPPLIED: Tablets, bottles of 100. Each tablet contains 25 mg. of HYDRODIURIL (hydrochlorothiazide) and 200 mg. of meprobamate.

DOSAGE: Usual adult dosage is one tablet once or twice a day, beginning on the first morning of symptoms and continuing until the onset of menses. CYCLEX may be continued through the menstrual period.

Before prescribing or administering CYCLEX, the physician should consult detailed information on use accompanying package or available on request.

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■ enhanced anti-inflammatory, antiallergic, antipruritic effects ■ far less gastrointestinal distress ■ may be of value when other corticoids have failed ■ virtually no mood changes, edema, sodium or water retention, or secondary hypertension

**Supply:** Scored tablets of 1 mg., 2 mg. and 4 mg. Syrup, in 120 cc. bottles, each 5 cc. teaspoonful containing 5.1 mg. triamcinolone diacetate providing 4 mg. triamcinolone.

*Glaser, J.: Ann. Allergy 18:510 (May) 1960.

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Squibb Quality—the Priceless Ingredient

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Asthma

provements include reduction from 30 days to 21 days of the time interval which elapses between pre-trial and the trial hearing; a speed-up in the resolution of disputed medical care cases resulting, in a pilot study of 300 cases, in the disposition of 166 within 10 days, and most of the remainder within 20 days; and sparing the worker the needless time and expense of a trip to the Board when he is not entitled to compensation and does not want a hearing or further information.

Col. Senior said that last year 609,000 industial accidents were reported to the Board. This is a drop-off of 29.3% from the peak year of 1951 when 861,000 were reported, and is the lowest figure since 1940. Even greater significance rests in the fact that covered employment has increased from approximately 3,600,000 in 1950 to 5,300,000 at present.

### Hire the Handicapped

The International Association of Personnel in Employment Security adopted unanimously a resolution encouraging greater understanding globally of the employability of handicapped at its 48th Annual Convention in Washington, D. C. on July 7. The resolution stated that IAPES will encourage and cooperate in the programs of the World Commission on Vocational Rehabilitation of the International Society and the Committee for the Handicapped of the "People-to-People" Program.

The International Association of Personnel in Employment Security is an organization of persons in community services stressing job placement and administering employment insurance benefit payments. Most members work for governmental agencies that perform these functions. IAPES advances employment security work, enlarges professional scope, improves techniques, and promotes professional competence of employment security workers everywhere. IAPES was formed in 1913. It is comprised of affiliated chapters from the states, territories, provinces and corresponding jurisdictions in other countries. The exchange of ideas, formal proposals, professional resolutions and the like start in these local organizations.

The objectives of the World Commission on Vocational Rehabilitation are to overcome employment problems of handicapped; increase employment of the handicapped, and conduct research and demonstration programs in vocational rehabilitation. The program is made possible by a United States Office of Vocational Rehabilitation grant as part of OVR's program of international research and demonstration in vocational rehabilitation. For further information on WCVR, contact Mr. John A. Nesbitt, Director-WCVR, International Society for Rehabilitation of the Disabled, 701 First Avenue, New York 17, N. Y.

The Committee for the Handicapped of the "People-to-People" Program works bilaterally between the United States and other countries to promote clearer understanding among the disabled people, increase understanding of disablement, act as a clearing house on information and pos-

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*of dependable performance,*
*exceptional tolerance*

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TOPICAL OINTMENT
EYE/EAR SUSPENSION

BRAND OF OXYTETRACYCLINE HCl AND HYDROCORTISONE

**Uniting the individually established effectiveness and exceptional tissue tolerance of TERRAMYCIN® and CORTRIL® (hydrocortisone)... for rapid symptomatic relief and resolution of lesions in skin, eye, and ear inflammation and infection.**

## IN BRIEF

TERRA-CORTRIL Topical Ointment and Eye/Ear Suspension unite the potent anti-inflammatory action of hydrocortisone (Cortril®) with the broad-spectrum anti-infective control of oxytetracycline (Terramycin®), for anti-infective, anti-allergic, and anti-inflammatory action in topical therapy. Unusually well tolerated, TERRA-CORTRIL makes possible the successful treatment of a wider range of dermatologic, ocular, and otic conditions with a single medication.

*Indications:* Topical Ointment – prevents or combats inflammation and infections in pyodermas, allergic and contact dermatoses, wounds, minor burns, and other inflammatory skin conditions with superimposed infections. Eye/Ear Suspension – prevents or combats inflammations of the external eye and ear and of the anterior ocular segment due to allergy, trauma, or infection due to TERRAMYCIN-sensitive organisms.

Supplemental oral antibacterial therapy is advisable in the treatment of severe infections or those which may become systemic.

*Administration and Dosage:* Topical Ointment – After thorough cleansing of affected skin areas, a small amount of ointment should be applied gently. Repeat up to four times daily. When actual infection is present, apply on sterile gauze for continuous contact with affected area.

Eye/Ear Suspension – *Ocular Conditions:* 1 or 2 drops into the affected eye three times daily. *Otic Conditions:* In external ear canal disorders, 2 to 4 drops three times daily, or as required. Keep dropper out of contact with infected area. In eye/ear infections that are deep-seated or spreading, systemic therapy should be employed concurrently.

*Side Effects:* Few instances of hypersensitivity to topically applied hydrocortisone have been reported. Allergic reactions to TERRAMYCIN are infrequent. TERRA-CORTRIL Topical Ointment or Eye/Ear Suspension should be discontinued if such reactions occur and are severe.

*Precautions and Contraindications:* Broad-spectrum antibiotics may cause overgrowth of nonsusceptible organisms, e.g., monilia, resistant staphylococci. If this occurs, discontinue the medication and take appropriate countermeasures. Topical Ointment: Allergic reactions to oxytetracycline are rarely encountered. With the possible exception of herpes simplex and second-degree burns, there are few dermatologic contraindications to topical use of hydrocortisone. Eye/Ear Suspension: There is considerable evidence that corticosteroids may be contraindicated both topically and systemically in certain infectious conditions of the cornea – particularly herpetic infections (dendritic keratitis, superficial punctate keratitis) and epidemic keratoconjunctivitis.

*Supplied:* Topical Ointment – In 1/6-oz. (5.0 Gm.) and 1/2-oz. (14.2 Gm.) tubes, containing 3% oxytetracycline (Terramycin®) hydrochloride and 1% hydrocortisone (Cortril®) alcohol in each gram of petrolatum base.

Eye/Ear Suspension – In 5 cc. amber bottles with sterile dropper. Each cc. of TERRA-CORTRIL Eye/Ear Suspension contains 5 mg. of oxytetracycline HCl (Terramycin®) and 15 mg. of hydrocortisone (Cortril®) acetate in a gel-like base of controlled viscosity.

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sible assistance, and channels rehabilitation devices to needy countries. Information on this program may be obtained from Mr. William P. McCahill, Vice-Chairman, Committee for the Handicapped, People-to-People Program, Washington, D. C. Mr. McCahill is also Vice-Chairman of the World Commission on Vocational Rehabilitation.

### The Well-Insured American

About 132 million Americans, 73% of the civilian population, had health insurance at the end of 1960, the Health Insurance Council reported after its 15th annual survey on the extent of voluntary health insurance coverage in the United States. The survey in based on reports from insurance companies, Blue Cross-Blue Shield, and other health care plans.

Benefit payments by all health insuring organizations to help cover the cost of hospital, surgical and medical care amounted in 1960 to more than $4.8 billion, up $500 million over 1959. In addition, persons with loss-of-income policies received $839 million in benefits from insurance companies to replace income lost through disability.

Thus, a grand total of $5,688,000,000 in health insurance benefits were distributed during 1960, up 10.1% over 1959.

The HIC, a federation of eight insurance associations, said that based on early trends for 1961 it estimated that as of June 1, 1961, some 134 million persons (74% of the civilian population) had hospital expense insurance, 123 million had surgical expense insurance, 89 million had regular medical expense insurance, 31 million had major medical expense insurance, and 42.5 million were insured against loss of income, or had some other formal sick leave pay arrangement.

The Council said these figures also revealed the breadth of health insurance protection which Americans have. The organization said that as of June 1, 92% of persons with health insurance had both hospital and surgical expense insurance, and 66% had hospital, surgical and regular medical expense insurance, which helps pay for doctor visits for non-surgical care. Five years ago, the figures were, respectively, 85 and 52%.

### Medical Administrators Meet to Visit

Visiting recently opened medical facilities of the New York Telephone Company, Western Electric Company and the Equitable Life Assurance Company will be the main order of business at the Third Annual Medical Administrators Association Meeting, New York City, September 28 and 29, 1961. Discussion periods will be held on the general subject of records, coding, distribution, and retention. Inquiries should be addressed to Mr. R. Mac Diarmid, Room 2400, 30 Rockefeller Plaza, New York City.

### The Seat of the Trouble

A typist got a choice between being fired for sloppy work or getting a spanking by the boss. She chose the spanking, and the boss was fined $56 for assault by a Penzance, England, court.

—*Industrial Relations News*, May 20, 1961.

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muscle
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potency
for greater
relief
of pain
and spasm

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Combining a superior skeletal muscle relaxant[1-3] with a preferred musculoskeletal analgesic,[4,5] *new* PARAFON FORTE rapidly relieves *both* pain and muscle stiffness in low back disorders. Thus, the effective dual action of PARAFON FORTE increases the patient's range of motion and hastens recovery. PARAFON FORTE is equally effective in other musculoskeletal disorders, such as myositis, whiplash injuries, strains or sprains, and fibrositis. Side effects are rare, almost never require discontinuation of therapy.

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TYLENOL® Acetaminophen 300 mg.

*Dosage:* Two tablets q.i.d. *Supplied:* Scored, light green tablets, imprinted "McNEIL," bottles of 50.

*References:* (1) Settel, E.: Clin. Med. *6*:1373, 1959. (2) Peak, W. P., and Smith, R. T.: Penn. Med. J. *63*:833, 1960. (3) Mayle, F. C.; Sullivan, P. D., and Auth, T. L.: Med. Ann. D. C. *28*:499, 1959. (4) Roth, J. L. A.: Med. Clin. N. Amer. *41*:1517, 1957. (5) Batterman, R. C., and Grossman, A. J.: J.A.M.A. *159*:1619 (Dec. 24) 1955.

*U.S. Patent No. 2,895,877

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No. 10 *in a series of washroom survey comments from "SBS soap counselors"*

*We showed them how "on-the-job" cleansing licks tough soil problems.*

**John Walsh**

**veteran SBS soap counselor, specializes in industrial soil removal. Here's his report after surveying a large paint manufacturing plant.**

"Workers in certain departments of this plant are in constant contact with soils that are hard to remove or irritating to the skin . . . for instance, paints, resins, thinners, pigments, and caustic soda. Management issued some protective clothing, but this measure still left face, hands and arms unprotected. Dermititis was on the increase. What to do?

"We recommended 'bringing the washroom to the worker' by installing *SBS 30 Waterless Washstations* in all of the sensitive areas. We knew from our survey that *SBS 30* will remove all of these problem soils — quickly, safely and at very low cost per clean-up."

***Money-saving suggestions*** like this *begin* with OPERATION PINPOINT–a thought-provoking presentation filled with facts about skin hygiene and washroom maintenance. The SBS soap counselor serving your area can pinpoint the right soap to do every skin cleansing job best and at lowest cost in your plant. Let him show you OPERATION PINPOINT . . . just call your nearest SBS office, collect.

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# Index of Advertisers


American Cancer Society . 40

Armour Pharmaceutical Co. . . . . 1

Becton, Dickinson & Co. . . 8

Bristol-Myers Co. . . . . 39

Chesebrough-Ponds, Inc. . . 24

Ciba Pharmaceutical Products, Inc. . . . . 9

Doak Pharmacal Co., Inc. . . 41

Dome Chemicals, Inc. . . . . 13

Eaton Laboratories . . . . . 16

Geriatric Pharmaceutical Corp. . . . . 42

Lederle Laboratories . . . . . 7

Lilly & Co., Eli . . . . . 26

NcNeil Laboratories, Inc. . . . . 36, 37

Merck Sharp & Dohme 11, 31

National Drug Co. . . . . 40

Natone Co. . . . . 42

Parke, Davis & Co. . . . . 19, 3rd cover

Pfizer Laboratories . . . . . 16a, 16b, 17, 34, 35

Riker Laboratories, Inc. . . . . 2nd cover

Robins Co., Inc., A. H. 14, 25

Sanborn Co. . . . . 23

Schering Corp. . . . 5, 15, 33

Searle & Co., G. D. . . . . 27

Shield Laboratories . . . . . 30

Squibb & Sons, E. R. . . . 2, 32

Sugar Beet Products Co. . . 38

Upjohn Co. . . . . 12

Wallace Laboratories . . . . 10, 18, 4th cover

Whitehall Laboratories 22, 28

Winthrop Laboratories 20, 21

Woodward Medical Personnel Bureau . . . . . 29

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*Based on 8.7% patient intolerance to plain aspirin therapy reported by Tebrock, H.E.: Ind. Med. & Surg. 20:480, 1951.

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the ORIGINAL, oral, anti-inflammatory enzyme tablet

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- speeds healing

Orenzyme effectively reduces both morbidity and length of convalescence in phlebitis. In a recent study, oral trypsin therapy was given to phlebitis patients ". . . unresponsive to the conventional forms of therapy." Results were conclusive—good to excellent response in all 35 cases.*

**Composition:** Each tablet contains trypsin 68%, chymotrypsin 30%, ribonuclease 2%, equivalent in proteolytic activity to 20 mg. of crystalline trypsin.

**Side Effects:** Orenzyme has a wide margin of safety. Toxic reactions and side effects are exceedingly rare. If they occur, discontinuation of the drug is recommended. Orenzyme is compatible with all commonly used drugs, including antibiotics. In infection, appropriate antibiotics should be used concurrently.

**Dosage:** Adequate dosage is important. Swallow initially, two tablets q.i.d. For maintenance, one tablet q.i.d.

**Supplied:** Bottles of 48 and 500 red, enteric coated tablets.

*Coleman, J.M., et al.: South. M.J. 53:1467, 1960.

THE NATIONAL DRUG COMPANY
Division of Richardson-Merrell Inc.
Philadelphia 44, Pa.

7/61 0-6195/61

## Why did the American Cancer Society grant this man $688,000?

**With $688,000 in research grants, Dr. Papanicolaou developed the *Pap Smear*, a detection aid for uterine cancer that has saved the lives of 175,000 women!**

HIS FULL NAME is Dr. George N. Papanicolaou. He allows himself to be called "Dr. Pap," which undoubtedly is a great time-saver for his busy laboratory colleagues. He is responsible for saving the lives of many thousands of women.

Dr. Pap pioneered the Pap Smear—a cell examination that is used to detect uterine cancer in its early stages, when the chances for cure are greatest. Uterine cancer (the second most common cancer in women) causes 14,000 deaths a year. Today, if every woman had the quick, simple examination called the Pap Smear once a year, there would be a *uterine cancer cure rate of nearly 100%*.

Your contribution to the American Cancer Society has made Dr. Pap's great work possible. It will continue to help men like him attain their ultimate goal—a cure for all cancer!

Guard your family. Fight cancer with a checkup and a check.

**AMERICAN CANCER SOCIETY**

## TOPICAL STEROID NEWS: BREAKTHROUGH IN THERAPY

In steroid responsive dermatoses you may prescribe new Panzalone Cream for rapid healing without concern about side effects and cost-to-patient, even when used on extensive areas for prolonged periods.

2% CREAM

# PANZALONE T.M.

delta-5-hemisuccinoxypregnenolone*, DOAK

## BREAKTHROUGH IN THERAPY

**because** the 2% concentration of Panzalone Cream helps assure quick relief of symptoms and more rapid healing of lesions,

**because** Panzalone is a new and fundamentally different steroid for topical application; it is non-corticoid and thus cannot produce corticoid side effects and

**because** cost-to-patient of an Rx for Panzalone Cream, reflecting the economies in synthesis of this new steroid, will be less than ½ the average for comparable topical steroid creams.

**Panzalone Cream is applied 3-4 times a day, supplied as 15 Gram (½ oz.) tubes.** Each gram of water washable cream contains 20 mg. of delta-5-hemisuccinoxypregnenolone (△5-pregnen-3(β)-hemisuccinoxy-20-one), DOAK with Buro-Sol®, DOAK (equivalent to 3.38 mg. aluminum acetate), pH 5.5. Distributed in Canada by Trans-Canada Pharmacal Co., Montreal, P. Q.

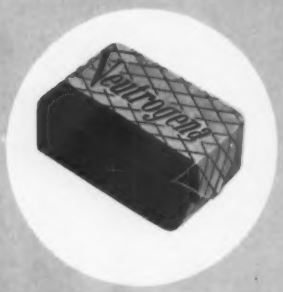
*PATENT PENDING

**DOAK** Pharmacal Co., Inc., New York 16, N. Y.

a short story on

# Industrial Dermatitis

In the treatment of Contact or Industrial Dermatitis, your first thought of a cleansing agent should be Neutrogena. (1) Because there is no clinical regression. (2) Because it is beneficial and soothing. (3) Because it is markedly less irritating than normal soaps.




## Neutrogena SOAP

We will be glad to supply, on request, professional samples and literature. Address: NEUTROGENA, 1207 West Sixth Street, Los Angeles 17, California. In Canada: Professional Pharmaceutical Corp., 2765 Bates Road, Montreal 26, Quebec.

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## massages pain away in musculoskeletal involvements[1]

## GER-O-FOAM

(aerosol foam)

## relieves pain, spasm; improves function increases tolerance to exercise

GER-O-FOAM's exclusive formula provides for the first time deeply absorbed analgesic-anesthetic agents in aerosol form — to permeate and anesthetize sensory nerve endings.

Relief in minutes, lasting for hours in . . . rheumatoid arthritis, osteoarthritis, muscle sprain, fibromyositis, low back pain . . . even in chronic intractable cases.

GER-O-FOAM combines: Methyl salicylate 30%, benzocaine 3%, in a neutralized emulsion base, permitting fast penetration through the stratum corneum.

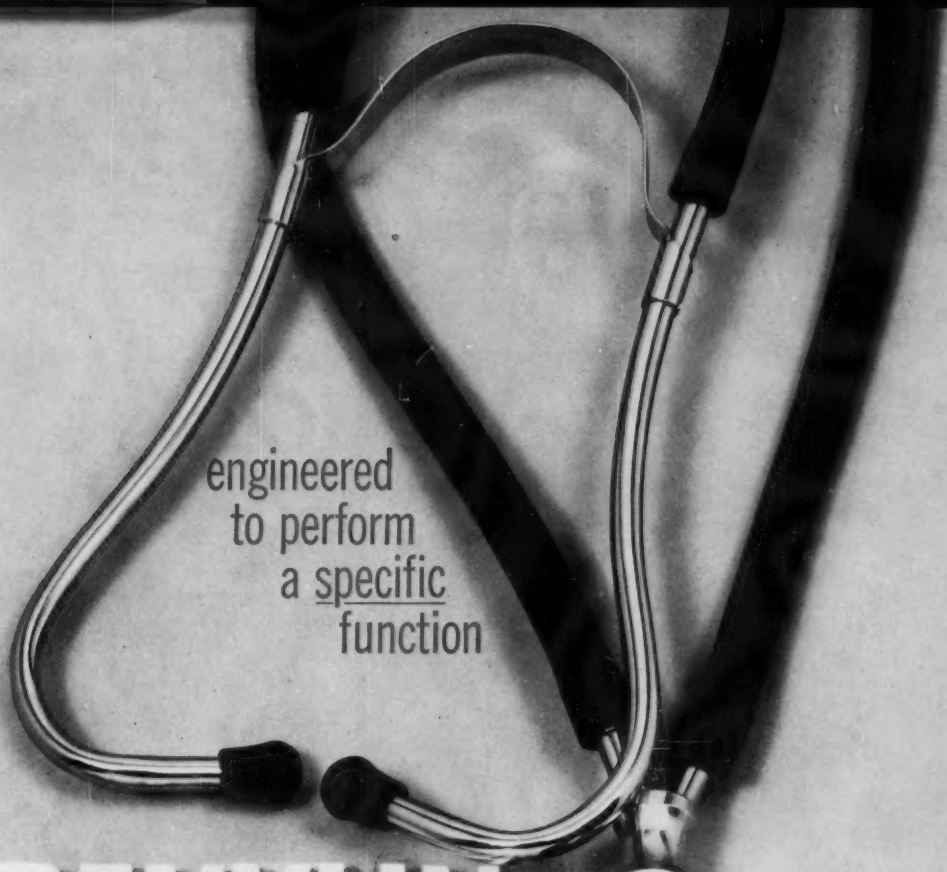
*Sample* and reprint from

**GERIATRIC PHARMACEUTICAL CORP.**

Bellerose, New York

***Pioneers in Geriatric Research***

1. Gordon, E. E. and Haas, A.: Industrial Medicine & Surgery 28:217, 1959.




# BENYLIN EXPECTORANT

## specifically designed to help control cough

Just as a medical instrument is engineered for maximum efficiency in performing its specific function, BENYLIN® EXPECTORANT is formulated to provide effective relief of cough associated with colds or allergy.

The outstanding antitussive action of BENYLIN EXPECTORANT is attributed to a combination of carefully selected therapeutic agents. Benadryl,® a potent antihistaminic-antispasmodic, reduces bronchial spasm, quiets the cough reflex, and lessens nasal stuffiness, sneezing, lacrimation, itching, and other allergic manifestations. Concurrent respiratory congestion is relieved by expectorant agents that efficiently break down tenacious mucosal secretions. In addition, a demulcent action soothes irritated throat membranes. 59261

BENYLIN EXPECTORANT is a pleasant-tasting, raspberry-flavored syrup...completely acceptable to patients of all ages.

**supplied:** BENYLIN EXPECTORANT is available in 16-ounce and 1-gallon bottles.

Each fluidounce contains: 80 mg. Benadryl Hydrochloride (diphenhydramine hydrochloride, Parke-Davis); 12 gr. ammonium chloride; 5 gr. sodium citrate; 2 gr. chloroform; 1/10 gr. menthol; and 5% alcohol. *Indications:* Relief of coughs due to colds, other symptoms associated with colds, and coughs of allergic origin. *Dosage:* Adults—1 to 2 teaspoonfuls every three to four hours. Children—½ to 1 teaspoonful every four hours. *Precautions:* Products containing Benadryl should be used cautiously with hypnotics or other sedatives; if atropine-like effects are undesirable; or if the patient engages in activities requiring alertness or rapid, accurate response (such as driving).

**PARKE-DAVIS**

PARKE, DAVIS & COMPANY, Detroit 32, Michigan

# Clinically Proven

in more than 750 published clinical studies
and over six years of clinical use

# Outstandingly Safe and Effective

for the tense and nervous patient

1 simple dosage schedule relieves anxiety dependably – without the unknown dangers of "new and different" drugs

2 does not produce ataxia, stimulate the appetite or alter sexual function

3 no cumulative effects in long-term therapy

4 does not produce depression, Parkinson-like symptoms, jaundice or agranulocytosis

5 does not muddle the mind or affect normal behavior

**Usual dosage:** One or two 400 mg. tablets t.i.d.

**Supplied:** 400 mg. scored tablets, 200 mg. sugar-coated tablets; bottles of 50. Also as MEPROTABS*– 400 mg. *unmarked*, coated tablets; and in *sustained-release* capsules as MEPROSPAN®-400 and MEPROSPAN®-200 (containing respectively 400 mg. and 200 mg. meprobamate).

*TRADE-MARK

# Miltown®

meprobamate (Wallace)

WALLACE LABORATORIES / *Cranbury, N. J.*

CM-6885